Certificate IV in Mechanical Plant Engineering

1. INTRODUCTION

1.1 Rationale

Mechanical Plant Engineering is one of the most fundamental disciplines in the developing economy. Its practitioners are in demand over a wide field of businesses and organisations providing infrastructure. Indeed, any installed process plant requires maintenance experts to manage its day-to-day running and execute repairs in a timely and efficient manner. Industries as diverse as textile manufacturers to food and pharmaceutical producers to energy suppliers and to the hospitality industry all require suitably qualified personnel in this field of engineering.

1.1.0 In 2010 the Fiji Institute of Technology became part of the Fiji National University and there was a need to review the current courses and the designing of a new syllabus for the Mechanical Plant Engineering.

1.2 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.

- 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.

1.3 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 is offered provides a recognisable qualification and a sound base for mechanical engineering students intending to specialise trade practices in Plant Maintenance Engineering. The training develops student skills and knowledge of the processes involved.

The course aims to develop the maintenance aspect of heat engines, Dynamic & Positive displacement pumps, power transmission devices, hydraulics', pneumatic, boiler plants, compressors, Industrial Instrumentation controls, PLC automation, building services and mechanical handling of equipment.

1.4 Aims and Objectives

Aims:

I To provide a basic technical skills course for industry which forms the basis for employment as a tradesman in Plant Maintenance 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 Maintenance Engineering 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 plant maintenance and other mechanical fields.

IV To develop the craft skills of the student to enable them to make a positive contribution to the standards and quality of plant maintenance 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 plant maintenance foremen 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 standards.

III To further provide the student with the basic technical knowledge and competencies essential for employment within the engineering 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. PROGRAM 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.

(b) Indentured applicants with less than the above requirements but at least two years industrial experience can be considered.

2.2 Credit Value of Program

The total credit value for the 22 units is 150 credits. One unit = 3min to 10 max credit points. The credit value for 1 equivalent full time student is 150 credits.

2.3 Duration of Program

The program should be completed in 2 years, including the mandatory minimum of twelve-month industrial attachment.

2.4 Cross Crediting

There are common units in the programme that is fully cross-creditable to common units with Certificate IV in Fitting and Machining.

All other units common to other School of Mechanical Engineering programs 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 Student Regulations (UASR).

3. PROGRAM STRUCTURE

3.1 General

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

The course consists of twenty two units drawn mainly from Level 3 and Level 4. The study time allocated to each unit will vary from 15min hours to 78max hours depending on the unit structure. The total instruction or contact time allocated will be 1260 hours and the student will be programmed for a further 990 hours of self-directed learning and private study. This time will be used both inside and outside the institute on assignments and projects. 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.

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 to 18 months industrial practice before they can be considered for the Trade Certificate award. The work experience attachments are done in between blocks.

3.5 Delivery Mode
The program is sandwich-type full-time trimester based on15-weeks. Students attend trimesters 1 (stage1), 2 (stage2), and 3 (stage3), and are released for 12 months industry attachment.

3.6 Order of Delivery
Students normally attend alternate trimesters and must progress through the three stages respectively. Units are time tabled according to the chronological order of the Program Descriptor. Content material instruction is delivered chronologically as itemised in the Unit Descriptors.

4. <u>ASSESSMENT</u>

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 workshop projects and assignments, classroom exercises and laboratory

practicals. Summative assessment takes the form of formal tests. Theoretical units also carry a final examination marked (E).

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).

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.

4.4 Fairness, Validity and Reliability

The program contains a balance of examinable and non-examinable units in order to provide fair assessment across a wide range of practical and academic abilities. Examinable units provide a high degree of objectivity whereas the 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.

Quantifiable assessment criteria and validation are explained in full in the University Academic Student Regulations (UASR).

5. TEACHING AND LEARNING METHODS

5.1 Introduction

A variety of teaching 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 Centred Learning

This is catered for in assigned tasks and projects as well as gaining experience in the industry attachment periods.

5.3 Methods

Information lectures coupled with workshop instruction and workshop practicals to develop hands-on skills and knowledge. Drawing practicals should be emphasised to develop representational abilities. Tutorials for practicing problem solving and other analytical skills and project work to develop initiative and teamwork.

6. MONITORING, EVALUATING AND REVIEW OF PROGRAM

6.1 School Board

The School Board (as detailed in the USAR) sits to review, discuss and amend individual results by consensus at the end of every stage.

6.2 Academic Board

The Academic Board (as detailed in the USAR) sits to review pass rate statistics and approve results by consensus at the end of every stage following the School Board.

6.3 On-going Monitoring

Progressive monitoring of the program is exercised in the following ways:

(I) Discussions within the Section's staff meetings, the School Board and the Academic Board, frequency: monthly;

(ii) Feedback from the IAC, individual employers and employer groups, trade and student unions and external moderators, frequency: approx. quarterly;

(iii) An established roster for staff vocational training locally and overseas, frequency: approx bi-annually;

(iv) Introductions of new technologies and industrial practices legislation, frequency periodic and

(v) Reviews by internal and external consultants, frequency: periodic.

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

The unit assessments are not externally moderated but the program is reviewed and approved by the IAC.

6.5 Industry Advisory Committee (IAC)

Composition at the time of publication:

Chairman: Uate Tukana (FEA)
Secretary: Head of School of Mechanical Engineering
Members: Representatives from:

1. FEA	5. FIT		
2. Telesource	6. Fletcher Steel		
3. Fiji Ships Ltd.			
4. TPAF			

Cert IV Plant Maintenance Engineering 2014 (Proposed name: Cert IV Mechanical Plant Engineering)

Trimester 1 (stage1)

	Code	Unit name	L	T	P	**Total Contact Hours in a Trimester (12Weeks)**	**Self-directed learning hours**	CP	Total learning hrs
1	FMG317	Basic Machining Process and Practice	1	1	4	72	48	8	120
2	PLM303	Bearings, Lubrication and Installation	1	1	4	72	48	8	120
3	MEN303	Engineering Drawing	4			48	42	6	90
4	MEN306	Engineering Material	2		2	48	42	6	90
5	OHS401	OHS	1	1		24	21	3	45
6	CIN102	Application of Computer Technology in Communication	2	1		36	24	4	60
7	PLM407	Lifting and Material Handling	1	1	3	60	60	8	120
8	EVG301	Ethics	1	1		24	21	3	45
9	MEN304	Workshop Calculation	2	1		36	24	4	60
		Total	**15**	**7**	**13**	**420**	**330**	**50**	**750**
		Student Total Contact hrs	**35**						

Trimester 2 (stage2)

	Code	Unit name	L	T	P	**Total Contact Hours in a Trimester (12Weeks)**	**Self-directed learning hours**	CP	Total learning hrs
1	PLM406	Principles of Heat Engines	1	1	4	72	63	9	135
2	PLM409	Electro Hydraulics and Pneumatics	1	1	4	72	63	9	135
3	ACR228	Building Services	1	1	2	48	12	4	60
4	MEN305	Introduction to Mechanics	2	1	2	60	15	5	75
5	PLM410	Industrial Instrumentation and PLC Control	1	1	3	60	75	9	135
6	MEN418	AutoCAD and Introduction to Solid Works	1		4	60	60	8	120
7	FWG302	Welding Process & Practice	1		3	48	42	6	90
		Total	**8**	**5**	**22**	**420**	**330**	**50**	**750**
		Student Total Contact hrs	**35**						

<u>Trimester 3</u> (stage3)

	Code	Unit name	L	T	P	**Total Contact Hours in a Trimester (12Weeks)**	**Self-directed learning hours**	CP	Total learning hrs
1	PLM404	Plant Operation and Maintenance Management	1	1	3	60	75	9	135
2	PLM403	Plant Engineering Technology	1	1	5	84	51	9	135
3	PLM405	Steam Plant	1	1	4	72	78	10	150
4	PLM408	Mechanical Power Transmission	1	1	5	84	51	9	135
5	EEE329	Electrical and Electronic Principles and Testing Equipment	2	1	2	60	15	5	75
6	MEN419	3D-CAD Using Solid Works	1		4	60	60	8	120
		Total	**7**	**5**	**23**	**420**	**330**	**50**	**750**
		Student Total Contact hrs	**35**						

STAGE 1 UNIT DESCRIPTOR

FIJI NATIONAL UNIVERSITY
College of Engineering, Science & Technology
School of Mechanical Engineering
Certificate IV in Mechanical Plant Engineering

Lecturer:	Semesa Lewanituva
Other Lecturers:	Kitione S Fesaitu / Atunaisa Lewenilovo

FMG317 Trimester : 1 Venue: Derrick Campus Title: Basic Machining Processes Credit Points 9

LECTURES:	Students are to attend 1 x 1 hours of lectures per week.	
TUTORIALS:	Students are to attend 1 x 1 hour tutorial class per week.	
LABS:	Students are to attend 1 x 4 hour of Practical's.	
SELF DIRECTED LEARNING	Students are to spend about 2 - 3 hours per week for this unit.	
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the unit according to the following day and time; **(Day & Time: To be advised)**	
PREREQUISITE:	The student must have completed FSLC.	
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.	
TOTAL LEARNING HOURS:	Contact Hours	72
	Lectures	8
	Tutorials	16
	Labs/Workshops/Practical's	48
	Self-Directed Learning (during term)	48

Self-Directed Learning (Midterm Break)	8
Self-Directed Learning (Study & Exam Weeks)	8
Total Recommended Learning Hours	136

1.0 Welcome

We welcome you to this Unit and hope that you will find it enriching and interesting.

1.1 Course Description

To enable the development of the elementary knowledge and skills required for efficient workshop safety and practice.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.1. Identify the hazard in workshop environment and develop procedures, through a report, for safe working.
1.2.2. Perform marking out exercises on plain surfaces.
1.2.3. Use a range of measuring instruments to determine accuracy of various shapes and compares them in the form of a report.
1.2.4. Use annotated sketches to outline the main features of common machine tools giving typical uses of each.
1.2.5. Select various cutting tools, with suitable angles for different machine tools, and explains the need for cutting fluid.
1.2.6. Describe the various marking-out tools and techniques for specified components.
1.2.7. Mark out a fitting job using the appropriate equipment.

1.2.8. Cut and shape material using the correct hand tools.
1.2.9. Cut internal and external screw threads.
1.2 10. Apply elementary joining techniques.
1.2.11. Safety and basic use of machines.
1.2.12. Mark out a fitting job using the appropriate equipment.

1.2.13. Cut and shape material using the correct hand tools.
1.2.14. Perform basic lathe operations.
1.2.15. Safety and basic use of machines.

2.0 Resources

2.1 Text

2.1.1 T. Gray T. A. & McCormick T., 1997. Metal Technics 2nd Edition.

2.1.2 Culley Ron, 2007. Fitting and Machining. ISBN 9781921426780. TAFE.

2.2 Supplementary Materials

2.2.1 Compiled Notes

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: WORKSHOP SAFETY

1. Causes of accidents.
2. Safety attire.
3. Care in the safe use of hand tools and electrical power tools.
4. Safety processes with regards to machines, tools, equipment, and accident situations.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Culley Ron, 2007. Fitting and Machining. Tafe Publication (pp. 3 - 8)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 2:WORKSHOP SAFETY

1. Fire regulations.
2. First aid.
3. Lifting techniques and handling equipment.
4. Use of ladders.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Culley Ron, 2007. Fitting and Machining. Tafe Publication (pp.12 - 20).	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

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Week 3: MARKING OUT TOOLS

1 .The selection and safe and correct use of the following instruments.

2. Centre punches.
3. Prick punch.
4. Surface plates.
5. Scribers/scribing block.
6. Engineers square.

No of Lectures	0
No. of Tutorials / Class Assessment 1	2
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Gray T. A. & McCormick T., 1997. (pp. 28 - 32)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	4

Week 4: MARKING OUT TOOLS

1. The selection and safe and correct use of the following instruments.
2. Dividers.
3. Engineers protractor.
4. Odd-leg calipers.
5. Angle plates.
6. Marking medium.

	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Gray T. A. & McCormick T., 1997. (pp. 28 - 32)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 5: FITTING HAND TOOLS

1. Selection, safety and correct use of the following hand tools for each particular applications.

2. Spanners and wrenches.
3. Pliers.
4. Hammers.
5. Cold chisels.
6. Bench vices.
7. Stock and dies.
8. Stud extractor.

No of Lectures	0

No. of Tutorials / Class Assessment 2	2
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Gray T. A. & McCormick T., 1997. (pp. 42 - 58)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 6: FITTING HAND TOOLS

1. Selection, safety and correct use of the following hand tools for each particular applications.

2.Bell punches.
3. Scrappers.
4. Screwdrivers.
5. Hacksaws.
6. Allen keys.
7. Files.
8. Taps and handle.
9. Reamers.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Gray T. A. & McCormick T., 1997. (pp. 42 - 58)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 7: FITTING HAND TOOLS (CONT'D)

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Gray T. A. & McCormick T., 1997. (pp. 42 - 58)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 8: MEASURING INSTRUMENTS

1. The selection and safe and correct use of the following instruments.
2. Micrometers.
3. Verniers.
4. Rulers and calipers.

5. Thread gauges.
6. Radius gauges.
7. Feeler gauge.

No of Lectures	0
No. of Tutorials / Class Assessment 3	2
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Gray T. A. & McCormick T., 1997. (pp. 32 - 37)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 9: MEASURING INSTRUMENTS

1. The selection and safe and correct use of the following instruments.
2. Drill angle gauges.
3. Centre gauge.
4. Dial test indicators.
5. Limit of sizes / limits and fits.
6. Bore gauges.
7. Depth gauge.

No. of Tutorials	1
No of Labs/Workshops/Practical's	1
Field Trip(s)	4
	0

Readings:

Gray T. A. & McCormick T., 1997. (pp. 32 - 37)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 10: MACHINE TOOLS

1. Lathes.
2. Shapers.

No of Lectures	
No. of Tutorials / Class Assessment 4	0
No of Labs/Workshops/Practical's	2
Field Trip(s)	0
	0

Readings:

Gray T. A. & McCormick T., 1997. (pp. 68 - 86 & 88 - 92)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 11: MACHINE TOOLS

1. Milling machines.
2. Drilling machines.
3. Off-hand Grinder.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Gray T. A. & McCormick T., 1997. (pp. 86 - 88, 59 - 63)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 12: FASTENERS

1. Types of fasteners and determining their features, sizes and uses.

2. Bolts and nuts.
3. Screws.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Gray T. A. & McCormick T., 1997. (pp. 94 - 96)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 13:

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practicals	0

Field Trip(s)	0

Readings:

	0
Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	0

Week 14: Study Week / Remedial

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

	0
Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	0

4.0 Assessment

Component	Weighting	Minimum Level

Practical Assessment	60%	50%
Assignment	12%	50%
Class Exercises/Quizes	12%	
Short Tests	16%	
Final Examination	0%	0%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	**Date**	**Weighting**
Assignment 1	Week 4	4%
Assignment 2	Week 6	4%
Assignment 3	Week 9	4%
Class Exercises/Quizes	After Completion of each topic.	12%
Class Test 1	Week 3	4%
Class Test 2	Week 5	4%
Class Test 3	Week 8	4%
Class Test 4	Week 10	4%
Practical Project Progress Marking 1	Week 3	20%
Practical Project Progress Marking 2	Week 6	20%
Practical Project Progress Marking 3	Week 9	15%
Practical Project Progress Marking 4	Week 11	5%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. The following grading system will be used:

Letter Grade Scale:

Grade	**Marks**	**Grade Point Average**
A+	90-100	4.33-5.00
A	85-89	4.00-4.27

A-	80-84	3.73-3.93
B+	75-79	3.33-3.60
B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

The academic conduct of the students is governed by the University Academic and Students Regulation (UASR). All students **must** obtain a copy of the UASR from the FNU academic office and familiarize themselves with all academic matters.

Should a student be dissatisfied with either the internal or external assessment, they can take the following steps to get redress of their grievance.

Internal Assessment: The student can refer the work back to the unit coordinator for checking and reassessment. Following this reassessment, if the student is still dissatisfied, the student may refer the work to the HOD. The HOD will then appoint another lecturer to examine the work and result will then stand.
Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

Plagiarism and Dishonest Practice Regulations
Plagiarism is taking another person's words or ideas and using them as if they were your own. It can be either deliberate or accidental. Plagiarism is taken very seriously in higher education. If even a small section of your work is found to have been plagiarized, it is likely that you will be assigned a mark of '0' for that assignment. In more serious cases, it may be necessary for you to repeat the course completely. In some cases, plagiarism may even lead to your expulsion from the university.

Actions that constitute plagiarism
1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.
2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY
College of Engineering, Science & Technology
School of Mechanical Engineering
Certificate IV in Mechanical Plant Engineering

Lecturer:	Kitione S Fesaitu
Other Lecturers:	Semesa Lewanituva and Atunaisa Lewenilovo

PLM303 Trimester : 1 Venue: Derrick Campus Title: Bearing and Lubrication Credit Points 8

LECTURES:	Students are to attend 1 x 1 hours of lectures per week.
TUTORIALS:	Students are to attend 1 x 1 hour tutorial class per week.
LABS/WORKSHOP/PRACTICALS	Students are to attend 1 x 4 hours of Labs per week.
SELF DIRECTED LEARNING	Students are to spend about 3hrsX 10 wks, 1hr X 2 wks and 8hrsX2wks for this unit.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the unit according to the following day and time; **(Day & Time: To be advised)**
PREREQUISITE:	The student must have completed FSLC
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:

Contact Hours	72
Lectures	11
Tutorials	12
Labs/Workshops/Practical's	44
Field Trip	5
Self-Directed Learning (during term)	32
Self-Directed Learning (Mid-term Break)	8
Self-Directed Learning (Study & Exam Weeks)	8
Total Recommended Learning Hours	120

1.0 Welcome

We welcome you to this Unit and hope that you will find it enriching and interesting.

1.1 Course Description

The purpose of this unit is to enable the development of elementary knowledge and skills required for maintenance of Bearings, Lubrication and Seals. This course offers the development of intermediate scientific knowledge and skills for mechanical plant trade trainees.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.1 Explain the construction of various types of plain bearings, selection and alignment for particular applications.

1.2.2 Explain different types of lubrication systems, and lubricants and the effects of speed, load and temperature on lubrication of a system.

1.2.3 Describe the characteristics types of wear, their causes and adjustments to be compensated in bearings and slides.

1.2.4 List different types of anti- friction bearings and their applications, outlining their procedure for fitting on shafts and housings and state the reasons for internal clearances on bearings as per machine specifications.

1.2.5 Distinguish between full-film lubrication, boundary lubrication, their construction and applications stating where they are of a particular advantage.

1.2.6 List requirements of good sealing practice, and differentiate between static and dynamic seal materials for specific purposes. Select and install the appropriate filters and seals.

2.0 Resources

2.1 Text

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Millwright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and Trainig Ltd.
2.1.2 Basaraba Bruce M. B.Ed. M.A, Power Transmission systems, 1989, IPT Publishing and Training Ltd.

2.2 Supplementary Materials

Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: BEARINGS

a) Describe the construction, application, removal, uses, and maintenance of the following types of bearings:

1) Bush	6) Porous	11) Roller
2) Sleeve	7) Non-metallic	12) Ball
3) Journal	8) Radial	13) Air
4) Collar thrust	9) Thrust	14) Pin
5) Pivot	10) Tapered rollers	

b). Describe methods of performing bearing alignment

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Millwright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and Training Ltd. (Pages 3-40) 1

2.1.2 Basaraba Bruce M. B.Ed.M.A, Power Transmission systems, 1989, IPT Publishing and Training Ltd. (Pages 60-107)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	3

Week 2: BEARINGS

c). Describe methods of locking bearings and slides

d). Discuss the reasons and remedies for the following types of wear

1). Fatigue 3). Abrasion 5). Spalling
2). Burning 4). Pitting

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Millwright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and training Ltd. (Pages 3-40) 1
2.1.2 Basaraba Bruce M. B.Ed.M.A, Power Transmission systems, 1989, IPT Publishing and Training Ltd. (Pages 60-107)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	3

Week 3: BEARINGS

e) Perform measurements to detect bearing wear.

f) Select bearings for specific applications from manufacturer's catalogues.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical’s	4
Field Trip(s)	0

Readings:

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Millwright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and training Ltd. (Pages 3-40) 1

2.1.2 Basaraba Bruce M. B.Ed.M.A, Power Transmission systems, 1989, IPT Publishing and training Ltd. (Pages 60-107)

Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	3

Week 4: LUBRICATION

a). Define a lubricant and identify their many types and forms:

1) Oils 3) Solids 5) Powders (graphite)
2) Greases 4) Liquids 6) other forms of bearing lubricants, etc.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Millwright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and training Ltd. 1
2.1.2 Basaraba Bruce M. B.Ed.M.A, Power Transmission systems, 1989, IPT Publishing and training Ltd. (Pages 46-60)

Reading lecture notes	0
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time) 3

Week 5: LUBRICATION

b). Define the following lubricant' properties:

1). Viscosity
2). Viscosity index
3). Oxidation stability
4). Demulsibility
5). Pour point
6). Flash point
7). Fire point.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Miillright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and training Ltd. 1

2.1.2 Basaraba Bruce M. B.Ed.M.A, Power Transmission systems, 1989, IPT Publishing and training Ltd. (Pages 46-60)

Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	3

Week 6: LUBRICATION

c). Describe full-film and boundary lubrication.

d). Discuss how various condition (speeds, temperatures, loads, etc.) affects lubricants and lubrication.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Miillright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and training Ltd. 1
2.1.2 Basaraba Bruce M. B.Ed.M.A, Power Transmission systems, 1989, IPT Publishing and training Ltd. (Pages 46-60)

Reading lecture notes	0
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	3

Week 7: LUBRICATION

e). Describe the various methods of applying lubricants:

1). Grease guns 5). Oil feeds 2). Grease cups 6). Wick feeds 3). Via hands 7). Mist
4). Splash lubrication 8). Gravity feed.

No of Lectures	1
No. of Tutorials/Test 1	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Miillright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and training Ltd. 2.1.2 1
Basaraba Bruce M. B.Ed.M.A, Power Transmission systems, 1989, IPT Publishing and training Ltd. (Pages 46-60)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	3

Week 8: SEALS AND GASKETS

a). Discuss, describe and identify the materials, applications, and functions of the following seals:

1). Gaskets
2). O-rings
3). Gland packings
4). Lip and Felt seals
5). Square packing
6). Rings
7). Labyrinth seals
8). Scrapers.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Miillright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and training Ltd. 1

2.1.2 Basaraba Bruce M. B.Ed.M.A, Power Transmission systems, 1989, IPT Publishing and training Ltd. (Pages 47-60)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	3

Week 9: SEALS AND GASKETS

b). Discuss between Static and Dynamic seals.

1). Compressed cork
2). Paper
3). Rubber
4). Varnished paper
5). Hard and soft materials
6). PTFE
7). Cord
8). Graphite impregnated cloth
9). Copper covered asbestos
10). Piston Rings
11). Labyrinth
12).Mechanical seals

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Miillright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and training Ltd. 1

2.1.2 Basaraba Bruce M. B.Ed.M.A, Power Transmission systems, 1989, IPT Publishing and training Ltd. (Pages 40-46,47-60)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time) 3

Week 10: SEALS AND GASKETS

c). Discuss the following seal materials and their applications:

1). Compressed cork
2). Paper
3). Rubber
4). Varnished paper
5). Hard and soft materials
6). PTFE
7). Cord
8). Graphite impregnated cloth
9). Copper covered asbestos
10). Piston Rings
11). Labyrinth
12).Mechanical seals

No of Lectures	0
No. of Tutorials/Test 2	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	5

Readings:

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Miillright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and training Ltd. 1

2.1.2 Basaraba Bruce M. B.Ed.M.A, Power Transmission systems, 1989, IPT Publishing and training Ltd. (Pages 40-46,47-60)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time) 3

Week 11: FILTERS

a). Identify the types, functions of the following filtering devices:

1). Screens 3). Paper 5). Centrifugal
2). Cloth 4). Absorbent

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Miillright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and training Ltd. 1
2.1.2 Basaraba Bruce M. B.Ed.M.A, Power Transmission systems, 1989, IPT Publishing and training Ltd. (Pages 40-46,47-60)

Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time) 1

Week 12: FILTERS

b). Identify the types applications of the following filtering devices:

1). Screens 3). Paper 5). Centrifugal
2). Cloth 4). Absorbent

	No of Lectures	1
	No. of Tutorials	1
	No of Labs/Workshops/Practical's	4
	Field Trip(s)	0

Readings:

2.1.1 Basaraba Bruce M. B.Ed, M.A and Journeyman Miillright, 1989, IPT's Industrial Trades Training Manual, IPT Publishing and training Ltd. 1
2.1.2
Basaraba Bruce M. B.Ed.M.A, Power Transmission systems, 1989, IPT Publishing and training Ltd. (Pages 40-46,47-60)

Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time) 1

4.0 Assessment

Component	Weighting	Minimum

		Level
2 Assignment	10%	50%
2 Class Exercises/Quizes	0%	
5 Laboratory exercises	20%	
2 Short Tests	20%	
Final Examination	50%	50%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	**Date**	**Weighting**
Assignment 1	Week 4	5.0%
Assignment 2	Week 6	5.0%
Laboratory/Workshop/Practicals	week 1-9, and 11-12	15.0%
Class Test 1	Week 7	10%
Class Test 2	Week 10	10%
Quiz-1 and 2		5%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendence of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. The following grading system will be used:

Letter Grade Scale:

Grade	**Marks**	**Grade**

		Point Average
A+	90-100	4.33-5.00
A	85-89	4.00-4.27
A-	80-84	3.73-3.93
B+	75-79	3.33-3.60
B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incompleste Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0

CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Teminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

The academic conduct of the students is governed by the University Academic and Students Regulation (UASR). All students **must** obtain a copy of the UASR from the FNU academic office and familiarize themselves with all academic matters.

Should a student be dissatisfied with either the internal or external assessment, they can take the following steps to get redress of their grievance.

Internal Assessment: The student can refer the work back to the unit coordinator for checking and reassessment. Following this reassessment, if the student is still dissatisfied, the student may refer the work to the HOD. The HOD will then appoint another lecturer to examine the work and result will then stand.

Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

Plagiarism and Dishonest Practice Regulations

Plagiarism is taking another person's words or ideas and using them as if they were your own. It can be either deliberate or accidental. Plagiarism is taken very seriously in higher education. If even a small section of your work is found to have been plagiarised, it is likely that you will be assigned a mark of '0' for that assignment. In more serious cases, it may be necessary for you to repeat the course completely. In some cases, plagiarism may even lead to your expulsion from the university.

Actions that constitute plagiarism

1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.
2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY

College of Engineering, Science & Technology

School of Mechanical Engineering

Certificate IV in Mechanical Plant Engineering

Lecturer:	Semesa Lewanituva
Other Lecturers:	Kelepi. Nabanivalu, Lagi Bailey, Melton Simmons

MEN303 Trimester : 1 Venue: Derrick Campus Title: Engineering Drawing Credit Points 6

LECTURES:	Students are to attend 1 x 4 hours of lectures per week.
TUTORIALS:	Students are to attend 1 x 1 hour tutorial class per week.
LABS:	N/A
SELF DIRECTED LEARNING	Students are to spend about 1 -2 hours per week for this unit.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the unit according to the following day and time; **(Day & Time: To be advised)**
PREREQUISITE:	The student must have completed FSLC.
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:	Contact Hours	66
	Lectures	48
	Tutorials / Class Assessment	18
	Labs/Workshops/Practical's	0
	Self-Directed Learning (during term)	26
	Self-Directed learning (Midterm Break)	3
	Self-Directed Learning (Study & Exam Weeks)	2
	Total Recommended Learning Hours	97

1.0 Welcome

We welcome you to this Unit and hope that you will find it enriching and interesting.

1.1 Course Description

To provide the students with the knowledge and skills required for competency in communicating engineering information using technical graphics.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.1 Understand the overview of engineering drawing system in a workplace.

1.2.2 Utilize different line types, print letters with correct character heights and able to dimension 2D drawing.

1.2.3 Construct geometrical shapes by the use of dividers, compass and ruler.

1.2.4 Produce orthographic drawings in first and third angle projection.

1.2.5 Produce isometric drawings with instruments to illustrate basic presentation techniques

1.2.6 Read and understand detail drawing.

1.2.7 Draw assembly drawing in first and third angle projection

1.2.8 Develop cones, cylinders, pyramids and prisms

2.0 Resources

2.1 Text

2.1.1 Boundy, A. W., 1991. Engineering Drawing, 3rd, 6th and 8th edition. ISBN 0074525301.

2.1.2 Greer, A., 1972. Mechanical Engineering Craft Studies Part 2. Edward Anorld.

2.2 Supplementary Materials

2.2.1 French, T. E. & Helsel, J., 2002. Mechanical Drawing 13th edition.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: Overview of Engineering Drawing System

1. Language of Industry

2. Drawing Office

3. What is CAD
4. Drawing Reproduction
5. Methods of Production and Standards

No of Lectures	4
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Boundy, A. W., 1991. Engineering Drawing, 3rd Edition. (pgs. 1 - 3)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 2: Line types, Lettering, Dimensioning on Drawings

1. Types of lines and usage
2 Formulating and spacing of letters.
3. Letter sizes and heights for notes, main headings, sub headings, title blocks.
4. Dimensioning and projection lines.

5. Dimensioning methods, Linear, angular, aligned, radii and small spaces,
6. Use of scales.

No of Lectures	4
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Boundy, A. W., 1991. Engineering Drawing, 3rd Edition. (p 6 - 7, p 12 - 15)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 3: Freehand Sketching Techniques, Drawing Paper Sizes & Layout

1. General principles of sketching, vertical, horizontal, inclined lines, large circles by rotating papers.
2. Paper sizes
3. Drawing sheet borderlines, title blocks.

No of Lectures	4
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Boundy, A. W., 1991. Engineering Drawing, 3rd Edition. (p 7-10).

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 4: Construct Geometrical Shapes

1. Geometrical construction used in engineering drawing
2. Basic construction, bisect, angles, lines, arcs, tangents, polygon, ellipse
3. Construct of geometrical shapes and templates.

No of Lectures	4
No. of Tutorials	1
No of Labs/Workshops/Practical's	0

Field Trip(s)	0

Readings:

Boundy, A. W., 1991. Engineering Drawing, 3rd Edition. (p. 117 - 119). Greer, A., 1972. Mechanical Engineering Craft Studies. (p. 86-90)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	2

Week 5: Construct Geometrical Shapes (con't)

1. Construct of geometrical shapes and templates.
2. Construct a plate cam, locking plate, file handle, trip catcher, cover plate, trip lever, bar locking plate, C wrench.
3. Construct spanner, saw handle, hacksaw handle, plane handle,
4. Reconstruct of geometrical shapes.

No of Lectures	4
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Boundy, A. W., 1991. Engineering Drawing, 3rd Edition. (p. 117 - 119)	
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	2

Week 6: Drawing Isometric Views

1. Introduction isometric projection
2. Procedure for producing isometric drawing.
3. Construction of isometric circles.

No of Lectures	4
No. of Tutorials / Class Assessment	4
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Boundy, A. W., 1991. Engineering Drawing, 3rd Edition. (p. 177 - 188)	
Reading lecture notes	2
Doing tutorial exercise	1

Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	3

Week 7: Drawing Orthographic Views [Mid Trimester Break]

1. Introduction, principle of projection
2. First angle projection
3. Layout of views

No of Lectures	4
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Boundy, A. W., 1991. Engineering Drawing, 3rd Edition. (p. 121 - 129)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	2

Week 8: Drawing Orthographic Views (con't)

1. Third Angle projection
2. Layout of views.

No of Lectures	4
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Boundy, A. W., 1991. Engineering Drawing, 3rd Edition. (p. 130 - 135)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 9: Detail and Assembly Drawing

1. Introduction different between detail and assembly drawing
2. Draw complete assemblies of components with sectional views, sectioning symbols and methods.
3. Draw a general assembly view in first angle projection of G clamp showing front view and sectional top view.

No of Lectures	4
No. of Tutorials	1
No of Labs/Workshops/Practical’s	0
Field Trip(s)	0

Readings:

Boundy, A. W., 1991. Engineering Drawing, 3rd Edition. (p. 197 - 199)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 10: Detail and Assembly Drawing (con't)

1. Draw complete sectional views including material list, balloon reference and dimensioning
2. Draw a general assembly view, in third angle projection, showing a complete front view and sectional end view.
3. Draw complete assembly view of a pulley and bracket and conveyer bracket including dimensioning.

No of Lectures	4
No. of Tutorials	1
No of Labs/Workshops/Practical’s	0

Field Trip(s)	0

Readings:

Boundy, A. W., 1991. Engineering Drawing, 3rd Edition. (p. 26 - 31)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 11: Development of Cones, Pyramids

1. Four basic shapes in sheet metal development, prism, cones, cylinders and pyramids.
2. Three methods of construction, parallel line development, radial line development, triangulation.
3. Development of cones and pyramids using radial line method of development

No of Lectures	4
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Boundy, A. W., 1991. Engineering Drawing, 3rd Edition. (p. 233 - 235)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	2

Week 12: Development Cylinders and Prisms

1. What is Parallel line development
2. Development of cylinders and prism using parallel line method of development.

No of Lectures	4
No. of Tutorials / Class Assessment	4
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Boundy, A. W., 1991. Engineering Drawing, 3rd Edition. (p. 233-235). Greer, A., 1972. Mechanical Engineering Craft Studies Part 2. (p. 118,119)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	

Recommended Self Learning Hours (Including Reading Time) 3

4.0 Assessment

Component	Weighting	Minimum Level
Assignment	30%	100%
Class Exercises/Quizes	40%	
Short Tests	30%	
Final Examination	0%	0%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	Date	Weighting
Assignment 1	Week 3	15.0%
Assignment 2	Week 5	15.0%
Class Exercise	Week 5	10%
Class Exercise	Week 6	10%
Class Exercise	Week 9	10%
Class Exercise	Week 11	10%
Short Test	Week 6	15%
Short Test	Week 12	15%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendence of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. The following grading system will be used:

Letter Grade Scale:

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B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0

CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

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Should a student be dissatisfied with either the internal or external assessment, they can take the following steps to get redress of their grievance.

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Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

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Actions that constitute plagiarism

1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.
2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY

College of Engineering, Science & Technology

School of Mechanical Engineering

Certificate IV in Mechanical Plant Engineering

Lecturer:	Atunaisa Lewenilovo
Other Lecturers:	TBA

MEN 306 Trimester : 1 Venue: Derrick Title: Engineering Material Credit Points 6

LECTURES:	Students are to attend 1 x 2 hours of lectures per week.
TUTORIALS:	N/A
PRACTICAL:	Students are to attend 1 x 2 hours of Labs per week.
SELF DIRECTED LEARNING	Students are to spend about 3hrsX8wks,4hrsX1wk,2hrsX3wks,8hrsX2wks for this course.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the course according to following times; (TBA)
PREREQUISITE:	The student must have completed FSLC
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:

	Contact Hours	48
	Lectures	20
	Tutorials	0
	Labs/Workshops/Practical's	20
	Field Trip(s)	8
	Self-Directed Learning (during term)	42
	Self-Directed Learning (Mid-Term Break)	8
	Self-Directed Learning (Study & Exam Weeks)	0
	Total Recommended Learning Hours	90

1.0 PURPOSE

The purpose of this unit is to enable the development of the elementary knowledge and skills required for using materials in engineering.

1.1 PERFORMANCE CRITERIA

Undertaking a variety of assignments, projects and tests to make subjective and objective decisions.
Practicing numerous laboratory experiments.
Maintaining close learning contact with tutors and tutorial assistants during timetabled hours.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:As a result of successfully completing this module the student will be able to:

1.2.1. Understand how iron and steels are produced and classifying engineering materials into various grades of steels, as ferrous and non-ferrous, metals and non-metals.

1.2. 2. Explain the principles of basic manufacturing processes of steels

1.2.3 Identify materials used in standard industrial processes and practice through visual and simple tests.

1.2.4 Describe with notes, the characteristics of common materials and identify the properties related to use.

1.2.5 Select materials and combinations of materials for specific tasks and state reasons for selection.

1.2.6 Describe the processes of heat treatment with reference to application.

1.2.7. Identify and explain the mechanisms of various types of corrosion and methods of surface protection of steels.

2.0 Resources

2.1 Text

Engineering Material (Material Science) By: S.C. Rangwala

2.2 Supplementary Materials

1. Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: Title: 1 ENGINEERING MATERIALS

Manufacturing of iron and steel. Classification of engineering materials into ferrous & non-ferrous metals, non-metals, synthetic & natural

No of Lectures	2
No. of Tutorials	0
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

Engineering Material (Material Science) By: S.C. Rangwala (Pages 171-288)

Reading lecture notes	2
Solving Problems	
Preparation of Laboratory Report	1

Recommended Self Learning Hours (Including Reading Time)	3

Week 2: Title: 1 ENGINEERING MATERIALS

Manufacturing of iron and steel. Classification of engineering materials into ferrous & non-ferrous metals, non-metals, synthetic & natural

No of Lectures	2
No. of Tutorials	0
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

Engineering Material (Material Science) By: S.C. Rangwala (Pages 171-288) and (Pages289-297)

Reading lecture notes	2
Solving Problems	
Preparation of Laboratory Report	1

Recommended Self Learning Hours (Including Reading Time)	3

Week 3: Title: PROPERTIES OF ENGINEERING MATERIALS

Manufacturing of iron and steel. Classification of engineering materials into ferrous & non-ferrous metals, non-metals, synthetic & natural

No of Lectures	2
No. of Tutorials	0
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

Engineering Material (Material Science) By: S.C. Rangwala (Pages 1-9)	
Reading lecture notes	2
Solving Problems	
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	3

Week 4: Title: PROPERTIES OF ENGINEERING MATERIALS

Tensile strength, compressive strength, shear strength
Elasticity, plasticity, malleability
Hardness, toughness, abrasion resistance
Rigidity, fusibility, temperature stability
Conductivity, electrical & thermal
Perform testing of engineering materials; tensile, hardness

Class Test 1	2
No. of Tutorials	0
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

Engineering Material (Material Science) By: S.C. Rangwala (Pages 10-42)	
Reading lecture notes	2

Assignment 1	1
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 5: Title: MANUFACTURING PROCESSES:

Processes of hot and cold working, work hardening, grain flow ; forging, hot rolling, extrusion, cold rolling, wire drawing and pressing.

No of Lectures	2
No. of Tutorials	0
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

Engineering Material (Material Science) By: S.C. Rangwala

Reading lecture notes	1
Assignment 1	1
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	3

Week 6: Title: MANUFACTURING PROCESSES:

Processes of hot and cold working, work hardening, grain flow ; forging, hot rolling, extrusion, cold rolling, wire drawing and pressing.

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	4

Readings:

Engineering Material (Material Science) By: S.C. Rangwala

Reading lecture notes	1
Solving Problems	
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	2

MID TRIMESTER BREAK

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

STUDY	8

Recommended Self Learning Hours (Including Reading Time)	8

WEEK 7 Title :GRADES OF STEEL

State carbon content, properties and application of low carbon, medium carbon, and high carbon steels. Simple workshop identification tests such as visual inspection, colour, spark test, file test. Effects of addition of carbon on plain carbon steels Alloy steels and alloying elements and their effect on the properties of steels Alloying elements – tungsten, molybdenum, chromium, vanadium, manganese, etc.

No of Lectures	2
No. of Tutorials	0
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

Engineering Material (Material Science) By: S.C. Rangwala (Pages 250- 255)	
Reading lecture notes	2
Solving Problems	
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	3

Week 8: Title: GRADES OF STEEL

State carbon content, properties and application of low carbon, medium carbon, and high carbon steels.
Simple workshop identification tests such as visual inspection, colour, spark test, file test.
Effects of addition of carbon on plain carbon steels
Alloy steels and alloying elements and their effect on the properties of steels
Alloying elements – tungsten, molybdenum, chromium, vanadium, manganese, etc.

Class Test 2	2
No. of Tutorials	0
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

Engineering Material (Material Science) By: S.C. Rangwala (Pages 260- 270)

Reading lecture notes	1
Solving Problems	
Preparation of Laboratory Report	1

Recommended Self Learning Hours (Including Reading Time)	2

Week 9: Title: HEAT TREATMENT OF STEELS

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Purpose and process of following heat treatment processes – hardening, tempering, annealing, normalizing, carburizing, case – hardening.

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	4

Readings:

Engineering Material (Material Science) By: S.C .Rangwala (Pages 258- 264)

Reading lecture notes	1
Assignment 2	1
Preparation of Laboratory Report	1

Recommended Self Learning Hours (Including Reading Time) 3

Week 10: Title 1: HEAT TREATMENT OF STEELS

Purpose and process of following heat treatment processes – hardening, tempering, annealing, normalizing, carburizing, case – hardening.

No of Lectures	2
No. of Tutorials	0
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

Engineering Material (Material Science) By: S.C. Rangwala (Pages 258- 264)

Reading lecture notes	1
Assignment 2	1
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	3

Week 11: Title: METAL SURFACE PROTECTION

Oxidation, combustion, corrosion. Surface protection of iron and steel – cladding galvanizing, sherardizing, metal spraying, painting, anodizing, electroplating. Reduction

No of Lectures	2
No. of Tutorials	0
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

Engineering Material (Material Science) By: S.C. Rangwala (Pages 289- 297)

Reading lecture notes	2
Solving Problems	

Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	3

Week 12: Title 1: METAL SURFACE PROTECTION

1. Oxidation, combustion, corrosion. Surface protection of iron and steel – cladding, galvanizing, sherardizing, metal spraying, painting, anodizing, electroplating. Reduction

Class Test 3	2
No. of Tutorials	0
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

Engineering Material (Material Science) By: S.C. Rangwala (Pages 289- 297)

Reading lecture notes	1
Solving Problems	
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	2

Title: STUDY BREAK

4.0 Assessment

Component	Weighting	Minimum Level
Assignment	10%	50%
Class Exercises		
Laboratory/Practical Test	10%	
Short Test	30%	
Final Examination	50%	50%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	Date	Weighting
Assignment 1	Week5	5%
Assignment 2	Week 10	5%
Class Test 1	Week 4	10%
Class Test 2	Week 8	10%
Class Test 3	Week 12	10%
Laboratory/Practical Test	Week 11	5%%
Laboratory/Practical Test	Week 12	5%%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. It is highly recommended that students attend all tutorials/labs/workshops. The following grading system will be used:

Letter Grade Scale:

Grade	Marks	Grade Point Average
A+	90-100	4.33-5.00
A	85-89	4.00-4.27
A-	80-84	3.73-3.93
B+	75-79	3.33-3.60
B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0

DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

The academic conduct of the students is governed by the University Academic and Students Regulation (UASR). All students **must** obtain a copy of the UASR from the FNU academic office and familiarize themselves with all academic matters.
Should a student be dissatisfied with either the internal or external assessment, they can take the following steps to get redress of their grievance.

Internal Assessment: The student can refer the work back to the unit coordinator for checking and reassessment. Following this reassessment, if the student is still dissatisfied, the student may refer the work to the HOD. The HOD will then appoint another lecturer to examine the work and result will then stand.
Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

Plagiarism and Dishonest Practice Regulations

Plagiarism is taking another person's words or ideas and using them as if they were your own. It can be either deliberate or accidental. Plagiarism is taken very seriously in higher education. If even a small section of your work is found to have been plagiarized, it is likely that you will be assigned a mark of '0' for that assignment. In more serious cases, it may be necessary for you to repeat the course completely. In some cases, plagiarism may even lead to your expulsion from the university.

Actions that constitute plagiarism

1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.

2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY
College of Engineering, Science & Technology
School of Mechanical Engineering
Certificate IV in Mechanical Plant Engineering

Lecturer:	Kitione S Fesaitu
Other Lecturers:	Semesa Lewanituva and Atunaisa Lewenilovo

PLM407 Trimester : 1 Venue: Derrick Campus Title: Lifting and material handling Credit Points 8

LECTURES:	Students are to attend 1 x 1 hours of lectures per week.
TUTORIALS:	Students are to attend 1 x 1 hour tutorial class per week.
LABS/WORKSHOP/PRACTICALS	Students are to attend 1 x 3 hours of Labs per week.
SELF DIRECTED LEARNING	Students are to spend about 4hrs X 11wks , 2hrs X 2wk and 8hrs X 2wks for this unit.

CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the unit according to the following day and time; **(Day & Time: To be advised)**
PREREQUISITE:	The student must have completed FSLC
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:

Contact Hours	60
Lectures	11
Tutorials	12
Labs/Workshops/Practical's	33
Field Trip	4
Self-Directed Learning (during term)	44
Self-Directed learning (Midterm Break)	8
Self-Directed Learning (Study & Exam Weeks)	8
Total Recommended Learning Hours	120

1.0 Welcome

We welcome you to this Unit and hope that you will find it enriching and interesting.

1.1 Course Description

The purpose of this unit is to enable the development of elementary knowledge and skills required for Plant installation and mechanical, materials handling of Plant equipment's. This course offers the development of intermediate scientific knowledge and skills for mechanical plant trade trainees.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.1 Produce working instructions to describe operations for the erection of temporary working platforms and the positioning of a major items of plant equipment to a prepared base.1.2.2 Produce drawings and instructions to describe the installation of specified equipment, Including preparation of working area.1.2.3 Produce a checklist for installation and inspection and hand over of plant including final alignment and adjustments.1.2.4 Produce a layout with specification notes for the handling and storage of a variety of materials including transporting details and quality control checks.1.2.5 Calculate the SWL for chains, fibre ropes, belts and FSWR slings.
1.2.6 Calculate the diameters required for lifting a particular load when using chains, fibre ropes, belts and FSWR slings.
1.2.7. Demonstrate the different types of knots required for lifting all types loads
1.2.8. Factor in the effects of reeve and load factor when lifting irregular loads and shapes.
1.2.9. Demonstrate crane signals for overhead cranes and Automobile hoist cranes.
1.3.0 Describe the uses and applications for all types of conveyors.

2.0 Resources

2.1 Text

2.1.1. David West., Expert advice from Des High field, Ivan Bignold, Phil Court, Chris Turner, Barry Haines, Roy Cullen and Jack Campbell, 1997, A guide to rigging. Second Edition, edited and published by Work covers New south Wales. Certification guide a) Rigging b). Certification c) OHS
2.1.2. Extracted information for engine foundations, from manuals of MAN and B&W diesel, Mirlees Blackstone, Caterpillar, Cummings and Wartsila.

2.2 Supplementary Materials

2.2.1. Supplementary information for engine foundations, from manuals of MAN and B&W diesel, Mirlees Blackstone, Caterpillar, Cummings and Wartsila .
2.2.2. Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: LIFTING AND HANDLING EQUIPMENT

a). Lifting appliances and jacks; crowbars, rollers and ramps.
b). Slings and slinging practice.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. A guide to rigging. Second Edition, edited by David West. Expert advice from Des High field, Ivan Bignold, Phil Court, Chris Turner, Barry Haines, Roy Cullen and Jack Campbell. Work cover New south Wales. Certification guide a) Rigging b). Certification c) OHS. (Pages 1-31)	2
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	4

Week 2: LIFTING AND HANDLING EQUIPMENT

a). Lifting signals. b). Safety requirements and Factories Act related to lifting. c). Precautions required when off-loading and handling plant and equipment such as cranes, bridges, gantry and jib cranes; application and maintenance. Electromagnetic brakes on lifting equipment, maintenance and adjustment.d). Operation and maintenance of electrical hoists (including the sliding rotor hoist).

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. A guide to rigging. Second Edition, edited by David West. Expert advice from Des High field, Ivan Bignold, Phil Court, Chris Turner, Barry Haines, Roy Cullen and Jack Campbell. Work cover New south Wales. Certification guide a) Rigging b). Certification c) OHS. (Pages 1-31, 32-55)	2
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	4

Week 3: LIFTING AND HANDLING EQUIPMENT

a). Prevention of damage to equipment.
b). Cranes; bridge, gantry and jib cranes; application and maintenance.
c). Electromagnetic brakes on lifting equipment, maintenance and adjustment.
d). Operation and maintenance of electrical hoists (including the sliding rotor hoist).

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practicals	3
Field Trip(s)	0

Readings:

1. A guide to rigging. Second Edition, edited by David West. Expert advice from Des High field, Ivan Bignold, Phil Court, Chris Turner, Barry Haines, Roy Cullen and Jack Campbell. Work cover New south Wales. Certification guide a) Rigging b). Certification c) OHS. (Pages 81-102)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 4: LIFTING AND HANDLING EQUIPMENT

a). Handling and care of slings, lifting chains and wire rope.
B). Testing of chains and wire rope.
C). Ladders, scaffolding and other access equipment, safety.
D). Dangers of overhead bare electrical power lines.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. A guide to rigging. Second Edition, edited by David West. Expert advice from Des High field, Ivan Bignold, Phil Court, Chris Turner, Barry Haines, Roy Cullen and Jack Campbell. Work cover New south Wales. Certification guide a) Rigging b). Certification c) OHS. (Pages 81-102)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 5: INSTALLATION OF PLANT

Pre-planning; adequate space for equipment and maintenance; method of access to the planned location. Services required; air, steam water, electricity, drainage, exhaust, ventilation.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. MAN and B&W diesel, Mirlees Blackstone, Caterpillar and Wartsila extracted manual information for engine foundations (Pages 104-137)	1
Reading lecture notes	1

Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 6: INSTALLATION OF PLANT

a). Reception and installation of heavy and irregularly shaped equipment.
B). Methods of holding down and fixing machines and equipment.
C). Characteristics of holding and fixing devices.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. MAN and B&W diesel, Mirlees Blackstone, Caterpillar and Wartsila extracted manual information for engine foundations (Pages 104-137)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1

1

Recommended Self Learning Hours (Including Reading Time)	4

Week 7: INSTALLATION OF PLANT

Selection.a). Vibration damping devices; characteristics of anti-vibration mountings.b). Types, wood, rubber, felt and springs, application.c). Grouting; cements.d). Leveling of machines.

No of Lectures	1
No. of Tutorials/Test 1	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. MAN and B&W diesel, Mirlees Blackstone, Caterpillar and Wartsila extracted manual information for engine foundations (Pages 104-137)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	4

Week 8: INSTALLATION OF PLANT

a). Alignment of machine couplings using slip gauges or dial test indicators.
b). Alignment of belt pulleys and chain sprockets.
c). Test running of newly installed plant checks.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. MAN and B&W diesel, Mirlees Blackstone, Caterpillar and Wartsila extracted manual information for engine foundations (Pages 104-137)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	4

Week 9: MATERIALS HANDLING

a). Materials handling of plant applications for the following;
Belts, conveyors, chain conveyors, link conveyors; overhead conveyors, slurry handling conveyors, pneumatic conveyors, screw conveyors, bucket conveyors.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. A guide to rigging. Second Edition, edited by David West. Expert advice from Des High field, Ivan Bignold, Phil Court, Chris Turner, Barry Haines, Roy Cullen and Jack Campbell. Work cover New south Wales. Certification guide a) Rigging b). Certification c) OHS 1
2. MAN and B&W diesel, Mirlees Blackstone, Caterpillar and wartsila extracted manual information for engine foundations (Pages 124-137)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	4

Week 10: MATERIALS HANDLING

a). Materials handling of plant maintenance and trouble shooting of conveyor plant.
Belts, conveyors, chain conveyors, link conveyors; overhead conveyors, slurry handling conveyors, pneumatic conveyors, screw conveyors, bucket conveyors.

No of Lectures	0
No. of Tutorials/Test 2	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	4

Readings:

1. A guide to rigging. Second Edition, edited by David West. Expert advice from Des High field, Ivan Bignold, Phil Court, Chris Turner, Barry Haines, Roy Cullen and Jack Campbell. Work cover New south Wales. Certification guide a) Rigging b). Certification c) OHS 1
2. MAN and B&W diesel, Mirlees Blackstone, Caterpillar and wartsila extracted manual information for engine foundations (Pages 124-137)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time) 4

Week 11: MATERIALS HANDLING

Materials, maintenance of belts and chain; joining; tension and tensioning devices.
Fork lift trucks; petrol, gas and battery types.
Maintenance and trouble shooting.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. A guide to rigging. Second Edition, edited by David West. Expert advice from Des High field, Ivan Bignold, Phil Court, Chris Turner, Barry Haines, Roy Cullen and Jack Campbell. Work cover New south Wales. Certification guide a) Rigging b). Certification c) OHS 2. MAN and B&W diesel, Mirlees Blackstone, Caterpillar and Wartsila extracted manual information for engine foundations (Pages 124-137)	1
Reading lecture notes	0
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 12: MATERIALS HANDLING

Materials, maintenance of belts; joining; tension and tensioning devices.
Fork lift trucks; petrol, gas and battery types.
Maintenance and trouble shooting.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. A guide to rigging. Second Edition, edited by David West. Expert advice from Des High field, Ivan Bignold, Phil Court, Chris Turner, Barry Haines, Roy Cullen and Jack Campbell. Work covers New south Wales. Certification guide a) Rigging b). Certification c) OHS — 0
2. MAN and B&W diesel, Mirlees Blackstone, Caterpillar and Wartsila extracted manual information for engine foundations (Pages 124-137)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 13:

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical’s	0
Field Trip(s)	0

Readings:

	0
Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	0

Week 14:

No of Lectures	0
No. of Tutorials	0

No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

James Stewart, Calculus, Thomson Brooks/Cole ,6th Edition (Chapter 12 pages 804 - 815)	0
Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	0

4.0 Assessment

Component	Weighting	Minimum Level
2 Assignment	10%	50%
2 Class Exercises/Quizes	5%	
4 Laboratory exercises	15%	
2 Short Tests	20%	
Final Examination	50%	50%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	Date	Weighting

Assignment 1	Week 4	5.0%
Assignment 2	Week 6	5.0%
Laboratory exercises	week 1-9 and 11-12	15.0%
Class Test 1	Week 7	10%
Class Test 2	Week 10	10%
Quiz-1 and 2	Week 4, 8	5%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. The following grading system will be used:

Letter Grade Scale:

Grade	Marks	Grade Point Average
A+	90-100	4.33-5.00
A	85-89	4.00-4.27
A-	80-84	3.73-3.93
B+	75-79	3.33-3.60
B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27

C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

The academic conduct of the students is governed by the University Academic and Students Regulation (UASR). All students **must** obtain a copy of the UASR from the FNU academic office and familiarize themselves with all academic matters.

Should a student be dissatisfied with either the internal or external assessment, they can take the following steps to get redress of their grievance.

Internal Assessment: The student can refer the work back to the unit coordinator for checking and reassessment. Following this reassessment, if the student is still dissatisfied, the student may refer the work to the HOD. The HOD will then appoint another lecturer to examine the work and result will then stand.

Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

Plagiarism and Dishonest Practice Regulations

Plagiarism is taking another person's words or ideas and using them as if they were your own. It can be either deliberate or accidental. Plagiarism is taken very seriously in higher education. If even a small section of your work is found to have been plagiarized, it is likely that you will be assigned a mark of '0' for that assignment. In more serious cases, it may be necessary for you to repeat the course completely. In some cases, plagiarism may even lead to your expulsion from the university.

Actions that constitute plagiarism

1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.
2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY

College of Engineering, Science & Technology

School of Mechanical Engineering

Certificate IV in Mechanical Plant Engineering

Lecturer:	Atunaisa Lewenilovo
Other Lecturers:	Kitione S Fesaitu

MEN304 Trimester : 1 Venue: Derrick Campus Title: Workshop Calculation Credit Points 4

LECTURES:	Students are to attend 1 x 2 hours of lectures per week.
TUTORIALS:	Students are to attend 1 x 1 hour tutorial class per week.
LABS:	N/A
SELF DIRECTED LEARNING	Students are to spend about 1 - 2 hours per week for this unit.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the unit according to the following day and time; **(Day & Time: To be advised)**
PREREQUISITE:	The student must have completed FSLC.
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:		
	Contact Hours	36
	Lectures	24
	Tutorials	12
	Labs/Workshops/Practical's	0
	Self-Directed Learning (during term)	22
	Self-Directed Learning (Midterm Break)	4
	Self-Directed Learning (Study & Exam Weeks)	4
	Total Recommended Learning Hours	66

1.0 Welcome

We welcome you to this Unit and hope that you will find it enriching and interesting.

1.1 Course Description

To enable the development of intermediate knowledge in calculating workshop related mathematical problems.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.1 Calculate lengths in the metric system and also areas and volumes of geometric forms.

1.2.2 Use SOHCAHTOA to solve trigonometry problems.

1.2.3 Apply statistical methods to establish averages, proportion, distribution related to workshop problems.

1.2.4 Calculate speeds and feeds and also cutting times for different machines.

1.2.5 Calculate and draw graphs.

1.2.6 Use Pythagoras Theorem to solve triangular problems.

2.0 Resources

2.1 Text

2.1.1 Greer & Howell, 1972. Mechanical Engineering Craft Studies Part 1, 2 and 3. Edward Arnold, London.

2.1.2 Chapman W. A., 1972. Elementary Workshop Calculations. Edward Arnold, London.

2.2 Supplementary Materials

Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: The Metric System

1. What is the metric system, millimeter, centimeter and meter?
2. Conversion of units.
3. Practical examples and exercise of measurements in the metric system.

No of Lectures	2
No. of Tutorials	1

No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Chapman W. A. , 1972. Elementary Workshop Calculations. (Chapter 1).	1
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 2: Arithmetic, Average, Ratio, Proportion and Percentage.

1. Addition, subtraction, multiplication, and division of fractions and decimals.
2. Convert from fractions to decimal from and vice versa. Accuracy, importance of decimal places / significant figures, scientific notation.

3. Averages, Percentages, Ratio and Proportions.
4. Use practical exercises to solve problems.

No of Lectures	2
No. of Tutorials	1
No of Labs/Workshops/Practical's	0

Field Trip(s)	0

Readings:

Chapman W. A. , 1972. Elementary Workshop Calculations. (Chapter 1).	1
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	2

Week 3: Arithmetic, Average, Ratio, Proportion and Percentage. (cont'd)

No of Lectures	2
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Chapman W. A. , 1972. Elementary Workshop Calculations. (Chapter 1).	1
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 4: Algebra

1. Brackets, solving equations requiring addition and subtraction.
2. Equations containing the unknown quantity on both sides.
3. Equations containing brackets.
4. Equations containing fractions.
5. Formulae's.
6. Use the spindle speed and cutting speed formulae to illustrate the above.

No of Lectures	2
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Greer & Howell, 1972. Mechanical Engineering Craft Studies Part 1, 2 and 3.	1
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	2

Week 5: Speeds and Feeds

1. Cutting speed when turning; spindle speed. Range of spindle speed, feeds when turning, volume of metal removal when turning.

2. Cutting speed when milling; spindle speed, feeds for milking, cutting time when milling, volume of metal removed when milling.

3. Cutting speed when drilling; spindle speeds, feeds when drilling, cutting times,, volume of metal removed when drilling.
4. Grinding feeds, wheel speeds, work speeds.
5. Cutting speed when shaping; feeds on a shaping machine, cutting time.
6. Examples and exercises related to machining.

No of Lectures	2
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Greer & Howell, 1972. Mechanical Engineering Craft Studies Part 1, 2 and 3. (Chapter 1 pages 4 - 10)	1
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 6: Speeds and Feeds. (cont'd)

No of Lectures	2
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	6

Readings:

Greer & Howell, 1972. Mechanical Engineering Craft Studies Part 1, 2 and 3. (Chapter 1 pages 4 - 10)	1
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	2

Week 7: Graphs

1. Axes of reference, scales, co ordinates, types of graphs.
2. Straight line graphs.
3. Laws of s straight line graphs.
4. Examples and exercises on plotting straight line graphs.

No of Lectures	2

No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Chapman W. A. ,1972.Elementary Workshop Calculations. (Chapter 1).	0
Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	0

Week 8: Graphs

1. Axes of reference, scales, coordinates, types of graphs.
2. Straight line graphs.
3. Laws of s straight line graphs.
4. Examples and exercises on plotting straight line graphs.

No of Lectures	2
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Chapman W. A., 1972. Elementary Workshop Calculations. (Chapter 1).	1
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	2

Week 9: Triangle and Pythagoras Theorem. (cont'd)

No of Lectures	2
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Chapman W. A. , 1972. Elementary Workshop Calculations. (Chapter 1).	1
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	2

Week 10: Angles and Trigonometry

1. Types of angles, angular measurement.
2. Convert from degrees in decimal form to degrees in deg-min-sec form and vice versa. Angle blocks.
3. Trigonometry; the notation for a right angle, the sine of an angle, the cosine of an angle, the tangent of an angle.
4. Practical problems on sine, cosine and tangent of angles e.g. sine bars, measurement of tapers, screw thread and gear calculations.

No of Lectures	2
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Chapman W. A. ,1972. Elementary Workshop Calculations. (Chapter 1).	1
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 11: Mensuration

1. Units - length, area, volume.
2. Properties of common plain figures - square, rectangle, circle, trapezium, triangle etc.

3. Volumes and surface area of solids [uniform cross-sectional area] cones and pyramids.
4. Area of similar shapes and volumes of similar solids.
5. Bending allowances for sheet metal work.

No of Lectures	2
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Greer & Howell, 1972. Mechanical Engineering Craft Studies Part 1, 2 and 3. (Chapter 1 pages 30 - 37)	1
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 12: Mensuration. (cont'd)

No of Lectures	2
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Greer & Howell, 1972. Mechanical Engineering Craft Studies Part 1, 2 and 3. (Chapter 1 pages 30 - 37)	1
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

Week 13:

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Reading lecture notes	0

Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	0

Week 14:

1. Cylinders
2. Quadratic Surfaces

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	0

4.0 Assessment

Component	Weighting	Minimum Level
Assignment	0%	50%
Class Exercises/Quizzes	10%	
Short Tests	40%	
Final Examination	50%	50%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	Date	Weighting
Class Assessment 1	Week 3	10%
Class Assessment 2	Week 5	10%
Class Assessment 3	Week 7	10%
Class Assessment 4	Week 10	10%
Class Exercise-1	Week 4	5%
Class Exercise-2	Week 6	5%
Final Examination	Week 14	50%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. The following grading system will be used:

Letter Grade Scale:

Grade	Marks	Grade Point Average
A+	90-100	4.33-5.00
A	85-89	4.00-4.27
A-	80-84	3.73-3.93
B+	75-79	3.33-3.60
B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0

AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

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2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

STAGE 2 UNIT DESCRIPTOR

FIJI NATIONAL UNIVERSITY **College of Engineering, Science & Technology** **School of Mechanical Engineering** **Certificate IV in Mechanical Plant Engineering**

Lecturer:	Kitione S Fesaitu
Other Lecturers:	Semesa Lewanituva and Atunaisa Lewenilovo

PLM406 Trimester : 2 Venue: Derrick Campus Title: Principles of heat engines Credit Points 9

LECTURES:	Students are to attend 1 x 1 hours of lectures per week.
TUTORIALS:	Students are to attend 1 x 1 hour tutorial class per week.
LABS: Workshop/Practical's	Students are to attend 4hrs X10wks of workshop practical's.
SELF DIRECTED LEARNING	Students are to spend about 4 hrs X 10wks, 3hrs X 1 and 8hrs X 2wks for this unit.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the unit according to the following day and time; **(Day & Time: To be advised)**
PREREQUISITE:	The student must have completed PLM303, MEN304 and MEN305

E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.	
TOTAL LEARNING HOURS:	Contact Hours	72
	Lectures	10
	Tutorials	12
	Labs/Workshops/Practical's	40
	Field Trip	10
	Self-Directed Learning (during term)	47
	Self-Directed Learning (Midterm Break)	8
	Self-Directed Learning (Study & Exam Weeks)	8
	Total Recommended Learning Hours	135

1.0 Welcome

We welcome you to this Unit and hope that you will find it enriching and interesting.

1.1 Course Description

The purpose of this unit is to enable the development of the elementary knowledge and skills required for handling heat engines.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1. Define terms, units and definitions of pressure; system and its boundary, cycle, ideal gas and non-ideal gas.2. Use Boyle's and Charle's laws,3. Define terms and units, properties and qualities, methods and principles of steam generation4. Describe the principle of operation of internal combustion engines and governors.5. Define fuel types, calorific values and combustion principles.6. Explain the necessity for blowers and intercoolers.7. Measure brake power using a dynamometer.8. Perform maintenance on engines.9. Use the correct tools in maintenance work,10. Use measuring instruments correctly and safely.11. Describe the principle of operation of internal combustion engines and governors.12. Maintaining engine accessories e.g. Boilers and intercoolers.13. Explain the necessity for blowers and intercoolers.14. Measure brake power using a electrical dynamometer and rope brake test.

2.0 Resources

2.1 Text

2.1.1 Alana Asmus & Barry Wellington, 1988, Diesel engines and fuel systems, 2nd edition , Pitman publishing PTY Ltd

2.1.2. Extracted notes from training manuals such as Cummings, MAN, B&W diesel, Mirlees Blackstone KV major, Ruston, Lister Petter, Caterpillar,Wartsila and Pielstick for Plant engine references.

2.2 Supplementary Materials

2.2.1. Supplementary notes from training manuals such as Cummings, MAN, B&W diesel, Mirlees Blackstone KV major, Ruston, Lister Petter, Caterpillar,Wartsila and Pielstick for Plant engine references. 2.2.2. Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: TERMS, UNITS AND DEFINITIONS

a). Pressure, units, methods for measuring pressure.
b). Differentiate between absolute, gauge, and atmospheric pressure.
c). Illustrate use of different pressure gauges, advantages and disadvantages in different applications
System and its boundary and what is meant by open and closed system.
d). Define a cycle with reference to heat engine.
e). Define an ideal gas and how it differs from a non-ideal gas.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Diesel engines and fuel systems, by Alana Asmus & Barry Wellington (Pages 1-74)	1
Reading lecture notes	2
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	4

Week 2: TWO / FOUR STROKE PETROL AND DIESEL ENGINE

a). Identify the 2 and 4 stroke cycle of an engine.
b). Identify the components of an engine and their working functions.
c). Perform the processes of maintaining the individual components of the engine.
d). Perform tests on engines.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical’s	4
Field Trip(s)	0

Readings:

1. Diesel engines and fuel systems, second edition by Alana Asmus & Barry Wellington 1
2. Extracted notes from training manuals such as Cummings, MAN, B&W diesel, Mirlees Blackstone KV major, Ruston, Lister Patter, Caterpillar, Wartsila and Pielstick for Plant engine references. (Pages 44-54)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	4

Week 3: EXPANSION AND COMPRESSION OF GASES

a). Boyle's and Charles' laws.
b). Derive the ideal gas law
c). Formulate ratios of expansion and compression

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practicals	4
Field Trip(s)	0

Readings:

1. Diesel engines and fuel systems, second edition by Alana Asmus & Barry Wellington 1
2. Extracted notes from training manuals such as Cummings, MAN, B&W diesel, Mirlees Blackstone KV major, Ruston, Lister Patter, Caterpillar, Wartsila and Pielstick for Plant engine references. (Pages 44-54)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time) 4

Week 4: ENGINE SYSTEMS

a). Identify different engine systems.
b).Identify and explain the functions of the key components of each system.
c).Trouble shooting of the different engine systems.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical’s	4
Field Trip(s)	0

Readings:

1. Diesel engines and fuel systems, second edition by Alana Asmus & Barry Wellington (Pages 111) 1
2. Extracted notes from training manuals such as Cummings, MAN, B&W diesel, Mirlees Blackstone KV major, Ruston, Lister Patter, Caterpillar, Wartsila and Pielstick for Plant engine references. (Pages 55-82, 103-111)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	4

Week 5: STEAM

a). Define steam, how it is measured . b).
Definitions of Sensible heat, latent heat, total heat.
c). Saturated steam and superheated steam, properties

No of Lectures	1

No. of Tutorials	1
No of Labs/Workshops/Practicals	4
Field Trip(s)	0

Readings:

2. Extracted notes from training manuals such as Cummings, MAN, B&W diesel, Mirlees Blackstone KV major, Ruston, Lister Patter, Caterpillar, Wartsila and Pielstick for Plant engine references. (Pages 111-135)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 6: STEAM

d). Effect of pressure on steam
e). Qualities of steam, how it is measured, wet and dry steam
f). Methods and principle of steam generation

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

2. Extracted notes from training manuals such as Cummings, MAN, B&W diesel, Mirlees Blackstone KV major, Ruston, Lister Patter, Caterpillar, Wartsila and Pielstick for Plant engine references. (Pages 111-135)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 7: ENGINE AUXILLARIES AND ACCESSORIES

a). Maintaining engine accessories e.g. Boilers, Turbochargers, fuel pumps, Lub-oil pumps, coolant pumps, blowers, drives , gears, Vacuum pumps, radiators etc.

No of Lectures	1
No. of Tutorials/Test 1	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Diesel engines and fuel systems, second edition by Alana Asmus & Barry Wellington (Pages 111)	1
2. Extracted notes from training manuals such as Cummings, MAN, B&W diesel, Mirlees Blackstone KV major, Ruston, Lister Patter, Caterpillar, Wartsila and Pielstick for Plant engine references. (Pages 55-82, 103-111)	
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 8: STEAM TURBINES

a). Construction details and Tip speeds, lubrication
b). Rankine cycle, specific steam consumption
c). Boiler & condenser pressures
d). Scavenge and feed pumps.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

2. Extracted notes from training manuals such as Cummings, MAN, B&W diesel, Mirlees Blackstone KV major, Ruston, Lister Patter, Caterpillar, Wartsila and Pielstick for Plant engine references. (Pages 83-100)	1
Reading lecture notes	0
Doing tutorial exercise	1
Practical preparation	2
Recommended Self Learning Hours (Including Reading Time)	4

Week 9: POWER MEASUREMENT

Perform brake test and calculations on the following; a).
Electrical dynamometer brake test.
b). Rope brake test c). Prony brake d). Hydraulic brake.

No of Lectures	0
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	5

Readings:

2. Extracted notes from training manuals such as Cummings, MAN, B&W diesel, Mirlees Blackstone KV major, Ruston, Lister Patter, Caterpillar, Wartsila and Pielstick for Plant engine references. (Pages 83-100) 1

Reading lecture notes	0
Doing tutorial exercise	1
Practical preparation	2
Recommended Self Learning Hours (Including Reading Time)	4

Week 10: POWER MEASUREMENT

Perform brake test and calculations on the following; a). Electrical dynamometer brake test.
b) Rope brake test

No of Lectures	0
No. of Tutorials/Test 2	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	5

Readings:

2. Extracted notes from training manuals such as Cummings, MAN, B&W diesel, Mirlees Blackstone KV major, Ruston, Lister Patter, Caterpillar, Wartsila and Pielstick for Plant engine references. (Pages 83-100)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	4

Week 11: FUELS AND COMBUSTION

a). Types of fuel
b). Calorific values
c). Principle of combustion

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Diesel engines and fuel systems, second edition by Alana Asmus & Barry Wellington (Pages 37, 42,45)	1
Reading lecture notes	2
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	4

Week 12: INTERCOOLERS INJECTION AND VALVE TIMING,

a). Principle of intercoolers
b). Valve, injector and ignition timing

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Diesel engines and fuel systems, second edition by Alana Asmus & Barry Wellington (Pages 26,)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	3

4.0 Assessment

Component	Weighting	Minimum Level
2 Assignment	10%	50%
2 Class Exercises/Quizzes	5%	
5 Laboratory exercises	15%	
2 Short Tests	20%	
Final Examination	50%	50%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	**Date**	**Weighting**
Assignment 1	Week 4	5.0%
Assignment 2	Week 6	5.0%
Laboratory exercises	week 1-8 and 11-12	15.0%
Class Test 1	Week 7	10%
Class Test 2	Week 10	10%
Quiz-1 and 2	Week 4,8	5%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. The following grading system will be used:

Letter Grade Scale:

Grade	**Marks**	**Grade Point Average**
A+	90-100	4.33-5.00
A	85-89	4.00-4.27
A-	80-84	3.73-3.93
B+	75-79	3.33-3.60
B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60

C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

The academic conduct of the students is governed by the University Academic and Students Regulation (UASR). All students **must** obtain a copy of the UASR from the FNU academic office and familiarize themselves with all academic matters.

Should a student be dissatisfied with either the internal or external assessment, they can take the following steps to get redress of their grievance.

Internal Assessment: The student can refer the work back to the unit coordinator for checking and reassessment. Following this reassessment, if the student is still dissatisfied, the student may refer the work to the HOD. The HOD will then appoint another lecturer to examine the work and result will then stand.

Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

Plagiarism and Dishonest Practice Regulations

Plagiarism is taking another person's words or ideas and using them as if they were your own. It can be either deliberate or accidental. Plagiarism is taken very seriously in higher education. If even a small section of your work is found to have been plagiarized, it is likely that you will be assigned a mark of '0' for that assignment. In more serious cases, it may be necessary for you to repeat the course completely. In some cases, plagiarism may even lead to your expulsion from the university.

Actions that constitute plagiarism

1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.
2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source’s words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY

College of Engineering, Science & Technology

School of Mechanical Engineering

Certificate IV in Mechanical Plant Engineering

Lecturer:	Atunaisa Lewenilovo
Other Lecturer's:	TBA

PLM409 Trimester : 2 Venue: Derrick Title: Electro Hydraulics & Pneumatics Credit Points 9

LECTURES:	Students are to attend 1 x 1 hours of lectures per week.
TUTORIALS:	Students are to attend 1 x 1 hours tutorial class per week.
PRACTICAL:	Students are to spend 4 hrs of Labs per week.
SELF DIRECTED LEARNING	Students are to spend 4hrsX7wks, 3hrsX3wks, 5hrsX1wk, & 8hrsX2wks for this course.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the course according to following times; (TBA)
PREREQUISITE:	The student must have completed PLM303, MEN304 and MEN305

E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.	
TOTAL LEARNING HOURS:	Contact Hours	72
	Lectures	11
	Tutorials	11
	Labs/Workshops/Practical's	44
	Field Trip(s)	6
	Self-Directed Learning (during term)	63
	Self-Directed Learning (Mid-Term Break)	8
	Self-Directed Learning (Study & Exam Weeks)	8
	Total Recommended Learning Hours	135

1.0 Welcome

The aim of this unit is to enable the student to develop the intermediate knowledge and skills of hydraulic and pneumatic technology.

1.1 Course Description

The aim of this unit is to enable the student to develop the intermediate knowledge and skills of hydraulic and pneumatic technology.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2. 1. Surveys a piped services installation, recording all components and condition with possible causes.

1.2.2 Investigates simple hydraulic installation, recording faults and diagnosing possible causes together with possible remedies.

1.2.3 Identifies the components of basic hydraulic and pneumatic circuits, understanding the functions of the individual components.

1.2.4 Design a variety of hydraulic and pneumatic circuits and test their operation on circuit boards.

1.2.5 Draw up a checklist for the maintenance of compressed air system including requirement for safe working conditions during overhaul and repair.

1.2.6 Observe the safety precautions when working with Hydraulic & Pneumatic Systems.

2.0 Resources

2.1 Text

1. Hydraulics and Pneumatics / Edition 2 by Andrew Parr
2. Fluid Power: Hydraulics and Pneumatics, 2nd Edition. By: James R. Daines
3. Practical Pneumatics By: Chris Stacey

2.2 Supplementary Materials

1. Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: Title: SAFETY

1. Emphasize the importance of cleanliness when working with hydraulic systems The effect of dust, dirt on hydraulic seals and the circuit.. Precautions when working with high pressure systems and during testing .Danger of pipe burst and its effect due to high pressure or incorrect relief valve setting. Misuse of compressed air.

No of Lectures	2
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Hydraulics and Pneumatics (Technician's and Engineer's Guide) By Andrew Parr (Pages 213-220)

Reading lecture notes	3
Solving Problems	
Preparation of Laboratory Report	

Recommended Self Learning Hours (Including Reading Time)	3

Week 2: Title: Basic Hydraulic Circuit and Parts

Introduction - Early developments and subsequent improvements. Fundamental Law of Pascal's. Advantages and disadvantages of hydraulic and pneumatic Power transmission. Pressure defined. Measurement of pressure. Atmospheric, Gauge vacuum and absolute pressures. Relationship between pressure, volume and temperature. Boyle's and Charle's Laws

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Hydraulics and Pneumatics (Technician's and Engineer's Guide) By Andrew Parr (Pages 1-33)
2. Practical Pneumatics By: Chris Stacey (Pages 73-84)

Reading lecture notes	3
Solving Problems	
Preparation of Laboratory Report	1

Recommended Self Learning Hours (Including Reading Time)	4

Week 3: Title: Basic functional circuit

1.Components of a basic hydraulic and pneumatic circuit
And their functions. Examples of hydraulic and pneumatic circuits for hydraulic
Jacks, ramps, forklifts, clamps, machine tools, etc.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Hydraulics and Pneumatics (Technician's and Engineer's Guide) By Andrew Parr (Pages 1-33)

Reading lecture notes	3
Solving Problems	
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 4: Title: Fluids

Primary functions – power transmission, lubrication, sealing and cooling. Quality requirements. Fluid properties – viscosity: effects of high and low viscosity, viscosity measurements, viscosity index. Pour point, oxidation resistance, demulsibility, rust and corrosion prevention. Fluid Conditioning – filters and seals, filter materials, filter types, Reservoirs and Receivers – construction, basic parts, and functions, Reservoir and receiver capacities.

Class Test 1	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Hydraulics and Pneumatics (Technician's and Engineer's Guide) By Andrew Parr (175-180)

Reading lecture notes	2
Assignment 1	2
Preparation of Laboratory Report	
Recommended Self Learning Hours (Including Reading Time)	4

Week 5: Title: CONTROL VALVES

Relief Valves

Simple Relief Valves - pilot operated, and piston relief valves. Functions and Construction. Pressure adjustments. Unloading valves and sequence valves.

Pressure regulating valves.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practicals	4
Field Trip(s)	0

Readings:

1. Hydraulics and Pneumatics (Technician's and Engineer's Guide) By Andrew Parr (Pages78-83)

Reading lecture notes	2
Assignment 1	2
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 6: Title: CONTROL VALVES

1. **Direction Control Valves**
Functions. Types – Check, in-line and right angle check valves. Two-way and four-way rotary valves. Two and four-way spool valves. Position in circuit. Identification using symbols.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical’s	4
Field Trip(s)	0

Readings:

1. Hydraulics and Pneumatics (Technician's and Engineer's Guide) By Andrew Parr (Pages84-96)

Reading lecture notes	3
Solving Problems	
Preparation of Laboratory Report	
Recommended Self Learning Hours (Including Reading Time)	3

MID TRIMESTER BREAK

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

STUDY	8
Recommended Self Learning Hours (Including Reading Time)	8

WEEK 7 **Title : CONTROL VALVES**

1. **Flow Control Valves**
Purpose. Control methods – Meter-In Circuit, Meter-Out Circuit, and Bleed-Off Circuit. Types of flow control valves. Pressure and non- pressure compensated flow control valves.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Hydraulics and Pneumatics (Technician's and Engineer's Guide) By Andrew Parr (Pages98-126)

Reading lecture notes	2
Solving Problems	2
Preparation of Laboratory Report	

Recommended Self Learning Hours (Including Reading Time)	4

Week 8: Title: HYDRAULIC PUMPS, ACTUATORS AND ACCESSORIES

Pumps – classification - Hydrodynamic and hydrostatic. Pressure ratings and volumetric efficiency. Types:- gear, vane, lobe, screw, and piston pumps and motors. Their construction, operation and maintenance. Advantages and disadvantages of various types.

Class Test 2	1
No. of Tutorials	1
No of Labs/Workshops/Practical’s	4
Field Trip(s)	0

Readings:

1. Hydraulics and Pneumatics (Technician's and Engineer's Guide) By Andrew Parr (Pages130-166)
(Textbook can be found at FNU Samabula Library)

Reading lecture notes	2
Solving Problems	2
Preparation of Laboratory Report	
Recommended Self Learning Hours (Including Reading Time)	4

Week 9: Title: HYDRAULIC PUMPS, ACTUATORS AND ACCESSORIES

Actuators and Accessories Linear and rotary motion – cylinders – single and double-acting. Accumulators, Intensifiers and Pressure Switches. Construction, application and maintenance.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical’s	4
Field Trip(s)	0

Readings:

1. Hydraulics and Pneumatics (Technician's and Engineer's Guide) By Andrew Parr (Pages167-183)
(Textbook can be found at FNU Samabula Library)

Reading lecture notes	2
Assignment 2	2
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 10: Title 1:HYDRAULIC PUMPS, ACTUATORS AND ACCESSORIES

1. **Industrial Circuits and Fault Diagnosis Charts**
   Examples of industrial hydraulic and pneumatic circuits. Fault diagnosis and logical trouble-shooting charts.

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	6

Readings:

1. Hydraulics and Pneumatics (Technician's and Engineer's Guide) By Andrew Parr (Pages185-208)
(Textbook can be found at FNU Samabula Library)

Reading lecture notes	2
Assignment 2	2

Preparation of Laboratory
Report

Recommended Self Learning Hours (Including Reading Time)	4

Week 11: Title: PNEUMATICS

1 **Introduction-** Comparison of hydraulic and pneumatic power transmission. Uses of compressed air. Statutory regulations relating to compressed air systems. Compressor layout. Identification of parts and their functions.

.2 **Compressors**

Compressor types- reciprocating, rotary and axial, piston, lobe, screw, turbo and centrifugal. Construction, application and maintenance. Advantages and disadvantages.

No of Lectures	1
No. of Tutorials	1
Practical Test1	4
Field Trip(s)	0

Readings:

1. Hydraulics and Pneumatics (Technician's and Engineer's Guide) By Andrew Parr (Pages56-66)
(Textbook can be found at FNU Samabula Library)

Reading lecture notes	3

Solving Problems	
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	4

Week 12: Title 1: Compressors

1. **Compressor Accessories**
   Intercoolers, after coolers, drain traps, valves, pressure switch, receivers – construction, function and maintenance

2. **Air Distribution System**
   Air distribution systems- Ring main. Point to consider for layout. Piping and drainage. Location of filters and lubricators. Layout of simple pneumatic circuit to pneumatic tool.

Class Test 3	1
No. of Tutorials	1
Practical Test 2	4
Field Trip(s)	0

Readings:

1. Hydraulics and Pneumatics (Third Edition)A technician's and engineer's guide by Andrew Parr (Pages 67-83)

Reading lecture notes	3
Solving Problems	
Preparation of Laboratory Report	
Recommended Self Learning Hours (Including Reading Time)	3

Title: STUDY BREAK

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practicals	0
Field Trip(s)	0

Readings:

STUDY	8
Recommended Self Learning Hours (Including Reading Time)	8

4.0 Assessment

Component	Weighting	Minimum Level
Assignment	10%	50%
Class Exercises		
Laboratory/Practical Test	10%	

Short Test	30%	
Final Examination	50%	50%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	Date	Weighting
Assignment 1	Week5	5%
Assignment 2	Week 10	5%
Class Test 1	Week 4	10%
Class Test 2	Week 8	10%
Class Test 3	Week 12	10%
Laboratory/Practical Test	Week 1-5,7-9	5%%
Laboratory/Practical Test	Week 11-12	5%%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendence of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. It is highly recommended that students attend all tutorials/labs/workshops. The following grading system will be used:

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C+	60-64	2.33-2.60
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C-	50-54	1.67-1.93
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P	Pass	0

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4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY

College of Engineering, Science & Technology

School of Mechanical Engineering

Certificate IV in Mechanical Plant Engineering

Lecturer:	TBA
Other Lecturers:	TBA

ACR 228 TRIMESTER : 2 Venue: Derrick Title: Building Services Credit Points 4

LECTURES:	Students are to attend 1 x 1 hour of lectures per week.
TUTORIALS:	Students are to attend 1 x 1 hour of tutorial per week.
LABS/WORKSHOP PRACTICE:	Students are to attend 1 x 2 hours of Workshop practice per week.
SELF DIRECTED LEARNING	Students are to spend about 6 - 8 hours per week for this course.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the course according to following times; (TBA)
PREREQUISITE:	The student must have completed MEN304, MEN305.
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:	Contact Hours	48

Lectures	12
Tutorials	12
Labs/Workshops/Practical's	24
Field Trip(s)	0
Self-Directed Learning (during term)	7
Self-Directed Learning (Midterm Break)	2
Self-Directed Learning (Study & Exam Weeks)	3
Total Recommended Learning Hours	60

1.0 Welcome

We welcome you to this unit and hope that you will find it enriching and interesting.

1.1 Course Description

This unit aims to enable the development of the elementary knowledge and skills required for the refrigeration trade and principles of water installations and distribution systems that exist in industrial buildings.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.1 Explain the operation of the vapour compression refrigeration cycle.

1.2.2 Identify the condition of the refrigerant in an operating vapour compression system.

1.2.3 Identify the major application for the vapour compressor cycle in the refrigeration and air-conditioning industry.

1.2.4 Accurately and neatly bend copper tube to specification.

1.2.5 Construct mechanical and brazed joints in refrigerant tubing that meet specification

1.2.6 Fit and remove service gauges to operating refrigeration systems.

1.2.7 Define and classify water and its sources of supply (treatment and Distribution)

1.2.8 Understand the requirements of the relevant model and local water bye-laws

1.2.9 Describe methods of jointing all materials (fittings) used for conveying cold water from Authorities Distribution system to Building

1.3.0 Recognize and name each type of cold water system

1.3.1 State the functional requirements and working principles of each system

1.3.2 Recognize different types of mains and service pipes used.

1.3.3 Describe the features of taps, cocks and valves

1.3.4 Compiles basic check list to inspect a cold water installation to ensure compliance with design specification and legal requirements

1.3.5 Recognize and name materials and components of Hot Water System.

1.3.6 Select materials for given jobs and state reasons for selection

1.3.7 Recognize and name Two types (direct an indirect) of Hot Water System.

1.3.8 State the functional requirements and working principles of each system

1.3.9 Demonstrate knowledge of heat transfer

1.4.0 Demonstrate knowledge and the principle ,methods of providing for expansions and different methods of pipe fixing

1.4.1 Understand the principles and design of drainage installation, inspections and testing for sewer and storm water drainage systems

1.4.2 Recognize sewage disposal schemes including septic tanks

1.4.3 Determine the pipe sizing venting and gradient

1.4.4 Understand the methods of waste pipe disposal, types of pipes, pipes sizing and pipe venting, traps

1.4..5 recognize sanitary services, types of fitting connections and installations

2.0 Resources

2.1 Text

2.1.1 Australian refrigeration and Air conditioning Volume 1 third edition by Graham Boyle

2.1.2 Australian refrigeration and Air conditioning Volume 2 third edition by Graham Boyle

2.1.3 Modern refrigeration and Air conditioning

2.1.4 Plumbing and mechanical Services1, 2 and 3 By A. H. Masterman and R. M. Boyce. & Plumbing-Cold Water Supplies,Drainage & Sanitation, By F.Hall

2.1.5 Building Services Engineering By David V. Chadderton ISBN 978-0-415-41355-8 5th Edittion 2007

2.1.6 Water and Plumbing Volume III Lfte Choudhury J. Trost ISBN 0-13-080337-5

2.1.8 Plumbing Cold Water Supplies Drainage and sanitation Third Edition By F. Hall IBSN 0-582-23405-0

2.2 Supplementary Materials

2.2.1 Supplementary notes (details) will be provided.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: Introduction : Heat Pressure and temperature

1.1 Heat, Heat flow, Heat transfer - Conduction, Convection, radiation

1.2 Heat measurement

1.3. Application of gas laws

1.4 Operation of the vapour compression system

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

Australian refrigeration and Air conditioning Volume 1 third edition by Graham Boyle chapter 29	0
Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	0

Week 2: Heat Pressure and temperature

2.1 Compressor

2.2 Evaporator

2.3 Condenser

2.4 Flow control

No of Lectures	1
No. of Tutorials	1

No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

Australian refrigeration and Air conditioning Volume 1 third edition by Graham Boyle chapter 29

Reading lecture notes

Doing tutorial exercise

Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	1

Week 3: Major Applications

3.1 scope of industry

3.2 domestic refrigeration

3.3 Commercial refrigeration

3.4 Industrial refrigeration

3.5 Transport/marine refrigeration

3.6 Comfort air conditioning

3.7 Industrial air conditioning

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	2

Field Trip(s)	0

Readings:

Australian refrigeration and Air conditioning Volume 1 third edition by Graham Boyle chapter 29

Reading lecture notes

Doing tutorial exercise

Practical preparation 1

Recommended Self Learning Hours (Including Reading Time)	1

Week 4: Tubing

4.1 Types, wall thickness, annealing

4.2 Safety and use of dry nitrogen to prevent oxidization.

4.3 Cutting and bending.

4.4 Using bending springs.

4.5 Lever benders.

4.6 Left side, right side and offset bending.

4.7 Tubing cleanliness.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical’s	2

Field Trip(s)	0

Readings:

Australian refrigeration and Air conditioning Volume 1 third edition by Graham Boyle chapter 29

Reading lecture notes

Doing tutorial exercise

Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	0

Week 5: Tube joining

5.1 Types of flaring block.

5.2 Preparation and positioning of tube.

5.3 Flaring correctly.

5.4 Flare nuts and common refrigeration brass fittings.

5.5 Recognition, size thread.

5.6 Use of thread sealants.

5.7 Tube expanders and swaging tools.

5.8 Silver and copper brazing.

5.9 Joining dissimilar metals.

5.10 Brazing alloys.

5.11 Fluxes.

5.12 Emphasis use of dry nitrogen.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	2
Assignment	0

Readings:

Australian refrigeration and Air conditioning Volume 1 third edition by Graham Boyle chapter 29

Reading lecture notes

Doing tutorial exercise

Practical preparation 1

Recommended Self Learning Hours (Including Reading Time) 1

Week 6: Service Gauges

6.1 types of gauges

6.2 care and maintenance of gauges, manifold and hoses

6.3 Service valves - Care, positioning – back seat, front seat etc.

6.4 Schraeder valves - Fitting, tightening, removing core.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	2
Mid trimester exam	0

Readings:

Australian refrigeration and Air conditioning Volume 1 third edition by Graham Boyle chapter 29

Reading lecture notes

Doing tutorial exercise

Practical preparation 1

Recommended Self Learning Hours (Including Reading Time) 1

week 7 Sources of water

Classification of water

- water cycle
- surface source

underground sources

types water treatment and distribution

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

2.1.4 Plumbing and mechanical Services1, 2 and 3 By A. H. Masterman and R. M. Boyce. & Plumbing-Cold Water Supplies, Drainage & Sanitation, By F.Hall

2.1.5 Building Services Engineering By David V. Chadderton ISBN 978-0-415-41355-8 5th Edition 2007

2.1.6 Water and Plumbing Volome III Lfte Choudhury J. Trost ISBN 0-13-080337-5

2.1.8 Plumbing Cold Water Supplies Drainage and sanitation Third Edition By F. Hall IBSN 0-582-23405-0

Recommended Self Learning Hours (Including Reading Time)	0
No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Week 8 Types of distribution systems and Types of pipes and Jointing methods

Ø Selection of materials

Connection from main to meter

Ø types of water meters

Ø Direct and indirect system

Ø advantages and disadvantages & applications, reticulation system, rectifying problem

Readings:

2.1.4 Plumbing and mechanical Services1, 2 and 3 By A. H. Masterman and R. M. Boyce. & Plumbing-Cold Water Supplies, Drainage & Sanitation, By F.Hall

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Recommended Self Learning Hours (Including Reading Time)	1

Week 9 Taps and valves

Ø Types of taps, parts of the taps

types of valves, part of the valves

method of installation of taps and valve

Maintenance taps and valves

Uses of taps and valves, noise control in taps and valves

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practicals	2

Field Trip(s)	0

Readings:

2.1.4 Plumbing and mechanical Services1, 2 and 3 By A. H. Masterman and R. M. Boyce. & Plumbing-Cold Water Supplies, Drainage & Sanitation, By F.Hall

2.1.5 Building Services Engineering By David V. Chadderton ISBN 978-0-415-41355-8 5th Edition 2007

2.1.6 Water and Plumbing Volome III Lfte Choudhury J. Trost ISBN 0-13-080337-5

2.1.8 Plumbing Cold Water Supplies Drainage and sanitation Third Edition By F. Hall IBSN 0-582-23405-0

Recommended Self Learning Hours (Including Reading Time)	0
No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	2
Field Trip(s)	1

week 10 CENTRALISED SYSTEMS

Ø Direct system, indirect system. Sealed primary circuit, Primatic cylinder, Combined cylinder and tank system, Indirect (conventional & secondary circuit)

COMPONENTS

Ø Cold feed cistern, Hot water cylinders

Ø Primary flow pipes, Primary return pipes

Ø Independent boilers, vents, cold feed, over flow

Ø Secondary return, Materials and pipe fixing

Ø Secondary return, Materials and pipe fixing

Readings:

2.1.4 Plumbing and mechanical Services1, 2 and 3 By A. H. Masterman and R. M. Boyce. & Plumbing-Cold Water Supplies, Drainage & Sanitation, By F.Hall

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2.1.8 Plumbing Cold Water Supplies Drainage and sanitation Third Edition By F. Hall IBSN 0-582-23405-0

Recommended Self Learning Hours (Including Reading Time)	1

Week 11 Sanitary appliance, flushing arrangements, sanitary accommodation

Materials used for sanitary appliances

Types of sanitary appliances (soil and waste appliances)

Soil and waste systems

Principles of systems

Traps

Testing of sanitary pipework's

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	2
Field Trip(s)	0

Readings:

2.1.4 Plumbing and mechanical Services1, 2 and 3 By A. H. Masterman and R. M. Boyce. & Plumbing-Cold Water Supplies, Drainage & Sanitation, By F.Hall

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Recommended Self Learning Hours (Including Reading Time)	0

Week 12 Drainage below ground, systems Ventilation and excess

Principles, terms used systems of drainage

Connection to Drainage

Septic tanks

grease traps

Gradients

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	2
class test	0

Readings:

2.1.4 Plumbing and mechanical Services1, 2 and 3 By A. H. Masterman and R. M. Boyce. & Plumbing-Cold Water Supplies, Drainage & Sanitation, By F.Hall

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2.1.8 Plumbing Cold Water Supplies Drainage and sanitation Third Edition By F. Hall IBSN 0-582-23405-0

Recommended Self Learning Hours (Including Reading Time)	1

Week 13:

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

	0
Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	0

4.0 Assessment

Component	**Weighting**	**Minimum Level**

Assignment	10%	50%
Practical Tests	20%	
Short Tests	20%	
Final Examination	50%	50%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	**Date**	**Weighting**
Assignment	Week 5	10%
Class Test 1	Week 6	10%
Class Test 2	Week 13	10%
Practical Test	Week 1 to 13	20%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and score at least 50% (ie. 50/100) in the course work and final examination separately. It is highly recommended that students attend all tutorials/labs/workshops. The following grading system will be used:

Letter Grade Scale:

Grade	**Marks**	**Grade Point Average**
A+	90-100	4.33-5.00
A	85-89	4.00-4.27
A-	80-84	3.73-3.93
B+	75-79	3.33-3.60

B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

The academic conduct of the students is governed by the University Academic and Students Regulation (UASR). All students **must** obtain a copy of the UASR from the FNU academic office and familiarize themselves with all academic matters.
Should a student be dissatisfied with either the internal or external assessment, they can take the following steps to get redress of their grievance.

Internal Assessment: The student can refer the work back to the unit coordinator for checking and reassessment. Following this reassessment, if the student is still dissatisfied, the student may refer the work to the HOD. The HOD will then appoint another lecturer to examine the work and result will then stand.
Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

Plagiarism and Dishonest Practice Regulations

Plagiarism is taking another person's words or ideas and using them as if they were your own. It can be either deliberate or accidental. Plagiarism is taken very seriously in higher education. If even a small section of your work is found to have been plagiarized, it is likely that you will be assigned a mark of '0' for that assignment. In more serious cases, it may be necessary for you to repeat the course completely. In some cases, plagiarism may even lead to your expulsion from the university.

Actions that constitute plagiarism

1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.
2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source’s words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY

College of Engineering, Science & Technology

School of Mechanical Engineering

Certificate IV in Mechanical Plant Engineering

Lecturer:	Atunaisa Lewenilovo
Other Lecturers:	Kitione S Fesaitu

MEN305 **Trimester : 2** **Venue: Derrick Campus** **Title: Introduction to Mechanics** **Credit Points** **5**

LECTURES:	Students are to attend 1 x 2 & 1 x1 hours of lectures per week.
TUTORIALS:	Students are to attend 1 x 1 hour tutorial class per week.
LABS:	Students are to attend 1 x 1 hour of Labs in week 5, 7 and 9.
SELF DIRECTED LEARNING	Students are to spend about 1 - 2 hours per week for this unit.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the unit according to the following day and time; **(Day & Time: To be advised)**
PREREQUISITE:	The student must have completed FSLC.
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:

	Contact Hours	54
	Lectures	28
	Tutorials	19
	Labs/Workshops/Practical's	7
	Self-Directed Learning (during term)	17
	Self-Directed Learning (Midterm Break)	3
	Self-Directed Learning (Study & Exam Weeks)	3
	Total Recommended Learning Hours	77

1.0 Welcome

We welcome you to this Unit and hope that you will find it enriching and interesting.

1.1 Course Description

This course offers the development of intermediate scientific knowledge and skills for mechanical trades' trainees.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.1 Measure temperature and heat.

1.2.2 Calculate electrical power consumption and the efficiency of machines driven by electric motors.

1.2.3 Determine the causes of friction and its effect on moving parts

1.2.4 Calculate work done, energy and power.

1.2.5 Identify different types of machines and solve practical problems on machines.

1.2.6 Calculate atmospheric pressure using a barometer or a manometer.

2.0 Resources

2.1 Text

2.1.1 Greer, A. & Howell, W. H.,1972. Mechanical Engineering, Part 1, 2,3 and 4. Edward Arnold, London.

2.1.2 Cleghorn, W. I., 2005. Mechanics of machines. ISBN-13: 978-0195154528

2.1.3 Bottomley, J. T., 2012. Hydrostatics. Nabu Press. ISBN-13: 978-1279210925

2.2 Supplementary Materials

Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: Temperature and Heat

1. Temperature: effects of heat, temperature, measuring temperature and high temperature, fusible cones and pellets, expansion of metals.
2. Heat: transmission of heat by conduction, convection and radiation, heat energy, specific heat, sources of heat energy.
3. Heat: heat exchange, heat exchange and cutting fluids, examples and exercises related to workshop situations.

No of Lectures	3
No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Greer, A. & Howell, W. H.,1972. Mechanical Engineering, Part 1, 2,3 and 4. (pages 57 -62).	0
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	
Recommended Self Learning Hours (Including Reading Time)	1

Week 2: Temperature and Heat (cont'd)

1. Temperature: effects of heat, temperature, measuring temperature and high temperature, fusible cones and pellets, expansion of metals.
2. Heat: transmission of heat by conduction, convection and radiation, heat energy, specific heat, sources of heat energy.
3. Heat: heat exchange, heat exchange and cutting fluids, examples and exercises related to workshop situations.

No of Lectures	2

No. of Tutorials / Class Assessment 1	2
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Greer, A. & Howell, W. H.,1972. Mechanical Engineering, Part 1, 2,3 and 4.(pages 57 -62).	0
Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	0

Week 3: Force and Moments

1. Effect of force. Units of force, mass, weight, types of forces, effect of force on engineering materials; tension, compression and bending.
2. Stress and strain, force as a vector quantity, representation of forces, resultant of forces, parallelogram of forces.
3. Moment of a force, principle of moments, reaction at the fulcrum, centre of gravity, balance and unbalance.
4. Examples and exercises to be workshop oriented.

No of Lectures	2
No. of Tutorials / Class Assessment 1	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Greer, A. & Howell, W. H.,1972. Mechanical Engineering, Part 1, 2,3 and 4. (pages 47 - 56).	0
Reading lecture notes	0
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	1

Week 4: Force and Moments (cont'd)

1. Effect of force. Units of force, mass, weight, types of forces, effect of force on engineering materials; tension, compression and bending.
2. Stress and strain, force as a vector quantity, representation of forces, resultant of forces, parallelogram of forces.
3. Moment of a force, principle of moments, reaction at the fulcrum, centre of gravity, balance and unbalance.
4. Examples and exercises to be workshop oriented.

No of Lectures	3
No. of Tutorials	1
No of Labs/Workshops/Practical's	1
Field Trip(s)	0

Readings:

Greer, A. & Howell, W. H.,1972. Mechanical Engineering, Part 1, 2,3 and 4. (pages 47 - 56).	0

Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	1

Week 5: Friction

1. Causes of friction, wear and the effects of friction, advantages and disadvantages of friction and effects of speed.
2. Coefficient of friction, selection of materials to reduce friction, lubrication of moving parts.
3. Friction in holding of work pieces and tools in position.
4. Examples and exercises to be workshop oriented.

No of Lectures	2
No. of Tutorials / Class Assessment 2	2
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Greer, A. & Howell, W. H.,1972. Mechanical Engineering, Part 1, 2,3 and 4. (pages 63 & 64).	0
Reading lecture notes	0
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	1

Week 6: Work, Energy and Power

1. Define Work, Work Done in lifting an object, Work Done by rotating forces, Work Done in cutting in cutting metal by movement of a force.
2. Potential Energy, Kinetic Energy and Conservation.
3. Define Power, Power and Cutting Speed, Power and Torque, Power lost in Friction, Electrical Power, Efficiency, and calculation of Power in belt and gear drives.
4. Define Energy, Potential Energy, Kinetic Energy and Conservation of Energy.

No of Lectures	2
No. of Tutorials / Class Assessment 3	2
No of Labs/Workshops/Practical's	1
Field Trip(s)	0

Readings:

Greer, A. & Howell, W. H.,1972. Mechanical Engineering, Part 1, 2,3 and 4. (pages 54 & 58).	0
Reading lecture notes	0
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	2

Week 7: Work, Energy and Power (cont'd)

1. Define Work, Work Done in lifting an object, Work Done by rotating forces, Work Done in cutting in cutting metal by movement of a force.

2. Potential Energy, Kinetic Energy and Conservation.

3. Define Power, Power and Cutting Speed, Power and Torque, Power lost in Friction, Electrical Power, Efficiency, and calculation of Power in belt and gear drives.

4. Define Energy, Potential Energy, Kinetic Energy and Conservation of Energy.

No of Lectures	3
No. of Tutorials	1
No of Labs/Workshops/Practical's	1
Field Trip(s)	0

Readings:

Greer, A. & Howell, W. H.,1972. Mechanical Engineering, Part 1, 2,3 and 4. (pages 54 & 58).	0
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	2

Week 8: Work, Energy and Power (cont'd)

1. Define Work, Work Done in lifting an object, Work Done by rotating forces, Work Done in cutting in cutting metal by movement of a force.

2. Potential Energy, Kinetic Energy and Conservation.

3. Define Power, Power and Cutting Speed, Power and Torque, Power lost in Friction, Electrical Power, Efficiency, calculation of Power in belt and gear drives.

4. Define Energy, Potential Energy, Kinetic Energy and Conservation of Energy.

No of Lectures	3
No. of Tutorials	1
No of Labs/Workshops/Practical's	1
Field Trip(s)	0

Readings:

Greer, A. & Howell, W. H.,1972. Mechanical Engineering, Part 1, 2,3 and 4. (pages 54 & 58).	0
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time) 2

Week 9: Simple Machines

1. Definition of a Simple Machine.

2. Velocity ratio, Mechanical Advantage and Efficiency. Law of a Machine - graphical. Frictional Effort.

3.Practical example and exercises of machines - Wheel and Axle, Screw Jack, Milling Machine Table, Rack and Pinion, Worm wheel.

4. Screw Jack e.g., nut and screw mechanism, Rack and Pinion e.g., lathe carriage movement, dial test indicator, Worm and Worm Wheel e.g. planning machine, Crank and Connecting Rod Mechanism e.g., feed mechanism of a shaping machine.

No of Lectures	2
No. of Tutorials / Class Assessment 4	2
No of Labs/Workshops/Practical's	1
Field Trip(s)	0

Readings:

Cleghorn, W. I., 2005. Mechanics of machines.(pages 288-304).	0
Reading lecture notes	0
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	2

Week 10: Simple Machines (cont'd)

1. Definition of a Simple Machine.

2. Velocity ratio, Mechanical Advantage and Efficiency. Law of a Machine - graphical. Frictional Effort.

3.Practical example and exercises of machines - Wheel and Axle, Screw Jack, Milling Machine Table, Rack and Pinion, Worm wheel.

4. Screw Jack e.g., nut and screw mechanism, Rack and Pinion e.g., lathe carriage movement, dial test indicator, Worm and Worm Wheel e.g. planning machine, Crank and Connecting Rod Mechanism e.g., feed mechanism of a shaping machine.

No of Lectures	2

No. of Tutorials	2
No of Labs/Workshops/Practical's	1
Field Trip(s)	0

Readings:

Cleghorn, W. I., 2005. Mechanics of machines. (pages 288-304).	0
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	2

Week 11: Fluids

1. Definition of a Fluid. Properties - density, relative density and viscosity.
2. Pressure - definition of units. Depth pressure, atmospheric, gauge and absolute pressure.
3. Forces exerted by a fluid against surfaces. Instruments - barometer, bourdon tube gauge, U-tube manometer etc. Flotation, Archimedes Principle.

No of Lectures	2
No. of Tutorials / Class Assessment 5	2
No of Labs/Workshops/Practical's	1
Field Trip(s)	0

Readings:

Bottomley, J. T., 2012. Hydrostatics. (Chapter 4 pages 230 - 239)	0
Reading lecture notes	0
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	2

Week 12: Fluids (cont'd).

1. Definition of a Fluid. Properties - density, relative density and viscosity.
2. Pressure - definition of units. Depth pressure, atmospheric, gauge and absolute pressure.
3. Forces exerted by a fluid against surfaces. Instruments - barometer, bourdon tube gauge, U-tube manometer etc. Flotation, Archimedes Principle.

No of Lectures	2
No. of Tutorials / Class Assessment 6	2
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Bottomley, J. T., 2012. Hydrostatics. Chapter 4, (pages 230 - 239).	0
Reading lecture notes	0

Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	1

Week 13:

1

2

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

	0
Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	0

Week 14:

1
2

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time) 0

4.0 Assessment

Component	**Weighting**	**Minimum Level**
5 Laboratory tests	20%	
Class Exercises/Quizzes	0%	50%
Short Tests	30%	
Final Examination	50%	50%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	Date	Weighting
Assessment 1	Week 2	5%
Assessment 2	Week 3	5%
Assessment 3	Week 5	5%
Assessment 4	Week 7	5%
Assessment 5	Week 9	5%
Assessment 6	Week 11	5%
Laboratory Test 1	Week 4	4%
Laboratory Test 2	Week 6	4%
Laboratory Test 3	Week 8	4%
Laboratory Test 4	Week 10	4%
Laboratory Test 5	Week 11	4%
Final Examination	Week 14	50%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the coursework and score at least 50% (i.e. 50/100) in the final examination. The following grading system will be used:

Letter Grade Scale:

Grade	Marks	Grade Point Average

A+	90-100	4.33-5.00
A	85-89	4.00-4.27
A-	80-84	3.73-3.93
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C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0

PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

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Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

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2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY
College of Engineering, Science & Technology
School of Mechanical Engineering
Certificate IV in Mechanical Plant Engineering

Lecturer: Kitione S Fesaitu (SME)
Other Lecturers: Vishal Charan (SEE)

PLM410 Trimester : 2 Venue: Derrick Campus Title: Industrial instrumentation and PLC Credit Points 9

LECTURES:	Students are to attend 1 x 1 hours of lectures per week.
TUTORIALS:	Students are to attend 1 x 1 hour tutorial class per week.
LABS/Workshops/Practical's	Students are to attend 1 x 3 hour of Labs per week.
SELF DIRECTED LEARNING	Students are to spend about 5hrs X 11wks, 4hrs X 1wk, and 8hrs X 2wks for this unit.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the unit according to the following day and time; **(Day & Time: To be advised)**
PREREQUISITE:	The student must have completed PLM303, MEN304 and MEN305
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:		
	Contact Hours	60
	Lectures	10
	Tutorials	11
	Labs/Workshops/Practical's	33
	Field Trip	6
	Self Directed Learning (during term)	59
	Self Directed Learning (Midterm Break)	8
	Self Directed Learning (Study & Exam Weeks)	8
	Total Recommended Learning Hours	135

1.0 Welcome

We welcome you to this Unit and hope that you will find it enriching and interesting.

1.1 Course Description

The purpose of this unit is to enable the development of the elementary knowledge and skills required for industrial instrumentation and PLC automation.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.1. Define the basic fundamentals and principles of industrial instrumentation and applications.1.2.2. Demonstrate the use of measuring instruments such as **level, pressure and temperature gauges.**1.2.3. Demonstrate effects and advantages of measuring instruments such as **level, pressure and temperature sensors.**
1.2.4. Demonstrate the use of flow meters and vibration measuring instruments.1.2.5. Distinguish the difference between, Decimal, Binary, Hexadecimal and Octal numbers1.2.6. Logic Gates 1.2.7. Understand the components of industrial automation.1.2.8. Introduction to PLC
1.2.9. Transforming basic wiring diagrams to ladder logic diagram.
1.3.0. Build basic circuits.

2.0 Resources

2.1 Text

2.1.0. Roger L. Tokheim, 1999,Degital electronics principles and applications 5th edition , McGraw-Hill Inc. 2.1.1 D Patranabis,1996, Principles of Industrial Instrumentation, 2nd Edition, Tata McGraw-Hill Inc. 2.1.2. Jack, H. Automating Manufacturing System with PLCs. Version 4.7, April 14,2005(Chapter 6)

2.2 Supplementary Materials

2.2.1. Logic gates from the Indian Institute for Production Management
2.2.2. Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: INSTRUMENTATION

3.0.0 Temperature measurement

3.0.1 a). Industrial applications of thermometers, thermocouples Type-J,T and K, melting pellets, chalk color coding, pyrometers and RTD (resistive temperature detectors).

b) Various scales available; Fahrenheit, Reaumur, Celsius, Kelvin and Rankine scale.

c). Thermocouple principle; The Seebeck, Peltier and Thomson effect.

d). Multiple Thermocouples and materials.

e) Measuring surface temperature and precautions to be observed.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

2.1.1. Roger L.tokheim, 1999,Degital electronics principles and applications 5th edition , McGraw-Hill Inc. 1
2.1.2 D Patranabis,1996, Principles of Industrial Instrumentation, 2nd Edition, Tata McGraw-Hill Inc. (Pages 4-64)

Reading lecture notes	2
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time) 5

Week 2: INSTRUMENTATION

3.1.0. Level measurement 3.1.1. Level gauges classifications-mechanical, thermal, or Electrical 3.1.2., Direct and indirect level gauges, direct look glass type, float types, single bellow elements level transmitter, differential bellow element level types, Displacer types, nozzle orifice types, ball valve actuated types level gauge, magnetic float types or switch type, variation of resistance **r** with current **i** in liquid or vapour, thermal type level control, scheme of resistance switching level type gauge

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

2.1.1. Roger L.tokheim, 1999,Degital electronics principles and applications 5th edition , McGraw-Hill Inc. 1
2.1.2 D Patranabis,1996, Principles of Industrial Instrumentation, 2nd Edition, Tata McGraw-Hill Inc. (Pages 4-64)

Reading lecture notes	2
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 3: INSTRUMENTATION

3.2.0 Pressure measurement 3.2.1. a). Force and its effects b). Fluid pressure measurement c) Measuring Limitations d) Atmospheric reference gauge e). Strain Gauge. F) Types of strain; shearing, axial, Poisson, bending and torsional strain. G). Sensors, Bonded resistance sensors
3.2.2. a). Installations and diagnostics. b). pressure gauge and switches 3.2.3. a). Mechanical to electronic pressure sensors, b). Capacitance pressure transducers. c) Potentiometer pressure transducer. d). Piezoelectric pressure sensor, e) Magnetic pressure transducer designs, f). Optical pressure transducer. 3.2.4 a) 3 way valve instrument isolation, b)Calibration. c). dead weight tester. d). Flow meters and Vibration measurement

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical’s	3

Field Trip(s) 0

Readings:

2.1.1. Roger L.tokheim, 1999,Degital electronics principles and applications 5th edition , McGraw-Hill Inc. 1
2.1.2 D Patranabis,1996, Principles of Industrial Instrumentation, 2nd Edition, Tata McGraw-Hill Inc. (Pages 4-64)

Reading lecture notes 2

Doing tutorial exercise 1

Practical preparation 1

Recommended Self Learning Hours (Including Reading Time) 5

Week 4: INSTRUMENTATION

3.3.0 Pressure measurement a). Force and its effects b). Fluid pressure measurement c) Measuring Limitations d) Atmospheric reference gauge e). Strain Gauge. F) types of strain; shearing, axial, Poisson, bending and torsional strain. G). Sensors, Bonded resistance sensors
3.3.1**.** a). Installations and diagnostics. b). pressure gauge and switches 3.3.2 a). Mechanical to electronic pressure sensors, b). Capacitance pressure transducers. c) Potentiometer pressure transducer. d). Piezoelectric pressure sensor, e) Magnetic pressure transducer designs, f). Optical pressure transducer. 3.3.3. a) 3 way valve instrument isolation, b)Calibration. c). dead weight tester. 3.3.4. Flow meters and Vibration measurement

No of Lectures 1

No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

2.1.1. Roger L.tokheim, 1999,Degital electronics principles and applications 5th edition , McGraw-Hill Inc. 1

2.1.2 D Patranabis,1996, Principles of Industrial Instrumentation, 2nd Edition, Tata McGraw-Hill Inc. (Pages 4-64)

Reading lecture notes	1
Doing tutorial exercise	2
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 5: INSTRUMENTATION

3.4.0 Number systems 3.4.1. a).

Decimal numbers, Binary, Hexadecimal and Octal numbers

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

2.1.0. Roger L.tokheim, 1999, Digital electronics principles and applications 5th edition , McGraw-Hill Inc. 1
2.1.2. Logic gates from the Indian Institute for Production Management (pages 81-96)

Reading lecture notes	2
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 6: INSTRUMENTATION

3.5.0. Logic Gates
3.5.1 a).Symbols, examples, inputs and outputs for the following invertors and gates; AND, OR, NAND, NOR, NOT, EX-NOR, EX-OR.
b) The Combination of logic gates to produce complex functions c) Substituting one gate for another making a NOT gate from NAND or NOR gate
d). Examples of building any gate from a NAND or NOR gate
e) The Boolean expression

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

2.1.0. Roger L.tokheim, 1999, Digital electronics principles and applications 5th edition , McGraw-Hill Inc.	1
2.1.2. Logic gates from the Indian Institute for Production Management (pages 81-96)	
Reading lecture notes	2
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 7: . Introduction Programme Logic Control

1.1 Function of a PLC

1.2 Types of PLC available

1.3 Choice of PLC

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. Jack, H. Automating Manufacturing System with PLCs. Version 4.7, April 14,2005(Chapter 1)	1
Reading lecture notes	2
Doing tutorial exercise	1

Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 8: Programme Logic Control INPUTS AND OUTPUTS

3.1. Installation of PLC

3. 2. Types of available input and output PLC modules

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. Jack, H. Automating Manufacturing System with PLCs. Version 4.7, April 14,2005(Chapter 6)	1
Reading lecture notes	2
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 9: Programme Logic Control INPUTS AND OUTPUTS

4.1 Electrical connections, ratings and precautions for input and output digital devices.

4.2.Types of input and output analogue devices which are monitored and controlled by a PLC.

No of Lectures	0
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. Jack, H. Automating Manufacturing System with PLCs. Version 4.7, April 14,2005(Chapter 6) 1

Reading lecture notes	2
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 10: Programme Logic Control INTRODUCTION TO PLC PROGRAMMING

5.1. Introduction to ladder language

5.2. PLC instruction set and addressing; relay, timer and counter instructions; comparison, arithmetic, logic and more instructions; file shift and sequence instructions; sub routine and group.

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	6

Readings:

1. Jack, H. Automating Manufacturing System with PLCs. Version 4.7, April 14,2005(Chapter 3) 1

Reading lecture notes	2
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time) 5

Week 11: PRACTICAL PLC APPLICATION AND SOLUTION

6.1. Write, install, run and test a number of practically based process control programs. These projects/ arrangements should simulate, as close as possible, the types of process the student will meet in the industry.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

1. Jack, H. Automating Manufacturing System with PLCs. Version 4.7, April 14,2005(Chapter 8)	1
Reading lecture notes	2
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 12: FAULT FINDING AND TROUBLE SHOOTING

7.3. Software, testing and simulation: diagnostic indicators; examination of parameters using data monitoring interpretation of status file information; searching and forcing.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

Stenerson, J. (2009). Programming Control Logic Programmable Automation Controllers. (chapter 16)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	4

Week 13:

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

	0
Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	0

Week 14:

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

	0
Reading lecture notes	0
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time) 0

4.0 Assessment

Component	Weighting	Minimum Level
2 Assignment	20%	50%
1 Class Exercises/Quizes	10%	
2 Short Tests	20%	
4 Laboratory exercises	50%	50%
Final Examination	N/A	N/A

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	Date	Weighting
Assessment	**Date**	**Weighting**
Assignment 1	Week 3	5.0%

Assignment 2	Week 5	5.0%
Assignment 3	Week 8	10.0%
Laboratory exercises	week 1-9 and 11-12	50.0%
Class Test 1	Week 7	10%
Class Test 2	Week 11	10%
Quiz-1	Week 8	10%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the 100% coursework . No final exam in this unit. The following grading system will be used:

Letter Grade Scale:

Grade	Marks	Grade Point Average
A+	90-100	4.33-5.00
A	85-89	4.00-4.27
A-	80-84	3.73-3.93
B+	75-79	3.33-3.60
B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60

D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

The academic conduct of the students is governed by the University Academic and Students Regulation (UASR). All students **must** obtain a copy of the UASR from the FNU academic office and familiarize themselves with all academic matters.

Should a student be dissatisfied with either the internal or external assessment, they can take the following steps to get redress of their grievance.

Internal Assessment: The student can refer the work back to the unit coordinator for checking and reassessment. Following this reassessment, if the student is still dissatisfied, the student may refer the work to the HOD. The HOD will then appoint another lecturer to examine the work and result will then stand.

Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

Plagiarism and Dishonest Practice Regulations

Plagiarism is taking another person's words or ideas and using them as if they were your own. It can be either deliberate or accidental. Plagiarism is taken very seriously in higher education. If even a small section of your work is found to have been plagiarized, it is likely that you will be assigned a mark of '0' for that assignment. In more serious cases, it may be necessary for you to repeat the course completely. In some cases, plagiarism may even lead to your expulsion from the university.

Actions that constitute plagiarism

1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.
2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY

College of Engineering, Science & Technology

School of Mechanical Engineering

Certificate IV in Mechanical Plant Engineering

Lecturer:	Atunaisa Lewenilovo
Other Lecturers:	Iliesa Cama, Kelepi. Nabanivalu

MEN418 Trimester : 2 Venue: Derrick Campus Title: Computer Aided Design Credit Points 8

LECTURES:	Students are to attend 1 x 1 hour of lectures per week.
TUTORIALS:	N/A
LABS:	Students are to attend 1 x 4 hour of Labs per week.
SELF DIRECTED LEARNING	Students are to spend about 2 - 3 hours per week for this unit.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the unit according to the following day and time; **(Day & Time: To be advised)**
PREREQUISITE:	The student must have passed MEN303 & FMG403.
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:	Contact Hours	60
	Lectures	12
	Tutorials	0
	Labs/Workshops/Practical's	48
	Self Directed Learning (during term)	42
	Self Directed Learning (Midterm Break)	8
	Self Directed Learning (Study & Exam Weeks)	10
	Total Recommended Learning Hours	120

1.0 Welcome

We welcome you to this Unit and hope that you will find it enriching and interesting.

1.1 Course Description

To provide the knowledge and skills, which will enable the students to create a drawing using computer aided drafting

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.1 Start Cad and create a drawing using commands available.

1.2.2 Create and edit a simple 2D drawing.

1.2.3 Create blocks and files.

1.2.4 Incorporate text, dimensions, tolerances, hatching

1.2.5 Create layers.

1.2.6 Save drawing file

1.2.7 Create 2D geometrical drawings, orthographic views and detail and assembly drawings.

2.0 Resources

2.1 Text

2.1.1 Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. AutoCAD 2011 for Engineers & Designers.

2.2 Supplementary Materials

Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: Introduction to AutoCAD

1. AutoCAD screen components, processing equipment, keyboard operations, terminology, function keys, mouse
2. Command window, Drawing status bar, invoking commands in AutoCAD, dialog boxes
3. Starting a new drawing, saving your work, creating back up files, closing a drawing.
4. Open an existing drawing, quitting cad, understand the concept of sheet set, creating a sheet set.
5. Creating and managing sheet sets.

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. (Chp 1, p1-45)	2
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	4

Week 2: Drawing Editor

1. Drawing lines in AutoCAD
2 Coordinate system, absolute, relative and polar coordinate system
3. Erasing objects, cancelling and undoing a command,
4. Drawing a circle.
5. Basic display commands, setting units type and precision.
6. Setting the limits of a drawing, introduction to plotting, modifying AutoCAD setting

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. (Chp 2, p2 - 32)	2

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	4

Week 3: Advance Sketching and Working with Aids

1. Drawing Arcs, rectangles, ellipse, polygons, polylines, donuts, placing points,
2. Drawing infinite lines, construction lines, ray,
3. Writing a single line text
4. Understand the concept and use of layers.
5. Object properties, changing color, line type, line weight, line type scale.
6. Drafting setting dialog box, ortho mode, object snap,
7. Function and control keys.

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. (Chp 3, p3 - 28, Chp 4,p2-41)	2

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	4

Week 4: Editing Sketched Object

1. Editing sketches, move, copy, offsetting, rotating.
2. Chamfering the sketched object, trimming, extending, and stretching.
3. Arraying the sketched object, rectangular and polar, mirror,
4. Editing object by using grips
5. Changing the properties using properties pellete, grips, zooming drawings

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. (Chp 5, p2-37, Chp6, p2 - 42)	2
Reading lecture notes	1

Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	4

Week 5: Creating Text

1. Annotation Object, scales,
2. Creating text, writing single line text, multiline text,
3. Editing text, using DDEDIT, properties pallete, modifying scale, justification of text.

4

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. (Chp 7, p2-26)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	3

Week 6: Basic Dimensioning

1. Need for dimensioning
2. Dimensioning in AutoCAD
3. Selecting dimensioning commands using ribbon and toolbar, using command line.
4. Creating linear, aligned, angular, radius, diameter, arc length and rotated dimension.

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	6

Readings:

Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. (Chp 8, p2 - 23)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	3

Week 7: Editing Dimension

1. Using editing tools
2. Editing by stretching, trimming and extending
3. Modifying dimensions, editing dimensioning text, properties pallete
4. Model space and paper space dimensioning.

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. (Chp 9, p 2 - 10)	2
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	4

Week 8: Dimension Styles, Multileader Styles, and System Variables

1. Using styles and variation to control dimensions.

2. Creating and restoring dimension style.
3. Controlling dimensioning style.
4. Dimension style families.
5. Modifying multileader style dialog box.

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. (Chp 10, p 2 - 31)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	3

Week 9: Adding Constraints to Sketches

1. Adding geometric constraints
2. Applying horizontal constraints, vertical, coincident, perpendicular, parallel
3. Controlling and display of constraints.

4. Concept of fully defined sketch.

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical’s	4
Field Trip(s)	0

Readings:

Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. (Chp 11, p1-16)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	3

Week 10: Model Space Viewports, Paper Space Viewports and Layouts

1. Model space and paper space layouts.
2. Creating tile viewports.
3. Editing viewports.
4. Controlling the properties of viewports layers.

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical’s	4

Field Trip(s)	0

Readings:

Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. (Chp 12, p1 - 20)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	3

Week 11: Hatching Drawings

1. Hatch patterns, using the hatch tools, hatch creation tab
2. Hatching the drawing using the tool pallets
3. Editing hatch patterns using hatchedit and properties command.
4. Editing the hatch boundary using grips, trimming hatch patterns, hatching blocks

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. (Chp 15, p2 - 24)	2

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	4

Week 12: Working with Blocks and Solid Works

1. Concept of blocks, advantage of using blocks, formation of blocks, converting entities into blocks.
2. Dynamic blocks, block editor, modifying existing blocks, layers, colors, line types.
3. Getting started with 3D, creating solid models, modifying, editing.
4. Surface modeling, mesh modeling

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Tickoo, S. (Prof.), Calumet, P. U. C., Saravan, D. 2011. (Chp 1, p1-45, chp 25,26,27)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	

Recommended Self Learning Hours (Including Reading Time) 3

4.0 Assessment

Component	Weighting	Minimum Level
Assignment / Projects	30%	100%
Class Exercises/Quizes	40%	
Short Tests	30%	
Final Examination	0%	0%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	Date	Weighting
Assignment 1	Week 3	15.0%
Assignment 2	Week 5	15.0%
Class Exercise	Week 5	10%
Class Exercise	Week 6	10%
Class Exercise	Week 9	10%
Class Exercise	Week 11	10%
Short Test	Week 6	15%
Short Test	Week 12	15%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. The following grading system will be used:

Letter Grade Scale:

Grade	Marks	Grade Point Average
A+	90-100	4.33-5.00
A	85-89	4.00-4.27
A-	80-84	3.73-3.93
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B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0

CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

The academic conduct of the students is governed by the University Academic and Students Regulation (UASR). All students **must** obtain a copy of the UASR from the FNU academic office and familiarize themselves with all academic matters.
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Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

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1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.
2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY

College of Engineering, Science & Technology

School of Mechanical Engineering

Certificate IV in Fabrication and Welding

Lecturer:	TBA
Other Lecturers:	TBA

FWG302 **Trimester : 2** **Venue: Derrick** **Title: Welding Process and Practice** **Credit Points** **6.00**

LECTURES:	Students are to attend 1 x 1 hour of lecture per week.
TUTORIALS:	N/A
LABS: Workshop.	Students are to attend 1 x 3 hours of Workshop Practice per week.
SELF DIRECTED LEARNING	Students are to spend about 3- 4 hours per week for this course.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the course according to following times; (TBA)
PREREQUISITE:	The student must have attended form 6 level of education or Equivalent
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:	Contact Hours	48
	Lectures	12
	Tutorials	0
	Labs/Workshops/Practical's	36
	Field Trip(s)	0
	Self Directed Learning (during term)	34
	Self Directed Learning (Mid-Term Break)	4
	Self Directed Learning (Study & Exam Weeks)	4
	Total Recommended Learning Hours	90

1.0 Welcome

We welcome you to this unit and hope that you will find it enriching and interesting.

1.1 Course Description

The purpose of this unit is to enable the development of intermediate knowledge and skills required for welding in a fitting and machining workshop.

1.2 Learning Targets/Outcomes

As a result of successfully completing this unit the student should be able to:
1. Demonstrate safe welding practice
2. Recognize GTAW machine and GMAW machine
3. Perform oxy-acetylene welding, cutting and brazing
4. Perform electric arc welding

2.0 Resources

Text

2.1 F.J.M.Smith 1975 Basic Fabrication and Welding Engineering Craft Studies Series

2.2 Supplementary Materials

2.1 Compiled Notes given by the unit Lecturer

2.2 John R Bedford 1971 Metal Craft Theory and Practice New International Metric Edition

2.3 A.Gray & T. Mc Cormick1998 Metal Techniques Second Edition

2.4 George Love 1983 Theory and Practice of METALWORK Third Edition

2.5 C.D. K irkcaldy 1994 Metal work Longman International Technical Texts

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References L T

Week 1: SAFETY 12 0

Personal Safety
Hazards to burns, sight.
Electric shocks. Procedures to be taken when a person is in contact with a live wire.
First Aid for electrical shocks.
Safety when handling cylinders, oxy-welding and arc welding equipment

No of Lectures	1	1
No. of Tutorials	0	
No of Labs/Workshops/Practical's	3	
Field Trip(s)		

Readings:

F.J.M.Smith 1975 Basic Fabrication and Welding Engineering Craft Studies Series Pages 1-23	1
Reading lecture notes	1
Solving Problems	
Preparation of Laboratory Report	

Recommended Self Learning Hours (Including Reading Time)	2

Week 2: GAS WELDING

Introduction to oxy-acetylene welding, explanation of basic principles
Equipment used.
Flame adjustment, neutral, carburising, oxidising - Application involving the use of flames and their advantages.
Filler rods, selection of rods and welding nozzles.
Effects of variable defectors in oxy-acetylene welding, influence of filler rod and blow pipe manipulation, welding speed and gas consumption.
Defects, recognition of defects in welding.

No of Lectures	1	1
No. of Tutorials	0	
No of Labs/Workshops/Practical's	3	
Field Trip(s)	0	

Readings:

F.J.M.Smith Basic Fabrication and Welding Engineering page 272-302	1
T.A.Gray & T. Mc Cormick1998 Metal Techniques Second Edition Pages 158-170	1
Reading lecture notes	1
Tutorial Exercise	
Solving Problems	
Preparation of Laboratory Report	

Recommended Self Learning Hours (Including Reading Time)	3

Week 3: ELECTRIC ARC WELDING.

Introduction to electric arc welding, explanation of basic principles.
Electrodes and current setting
Equipment used
Methods of striking arcs, breaking the arc and re-striking, control of liquid metal and slag.
Penetration of weld, effect of current, arc length, speed of travel, angle of electrode and plate thickness on depth of root penetration and quality of weld.

No of Lectures	1	1
No. of Tutorials	0	
No of Labs/Workshops/Practical's	3	
Field Trip(s)	0	

Readings:

F.J.M.Smith Basic Fabrication and Welding Engineering page 272-302	1
T.A.Gray & T. Mc Cormick1998 Metal Techniques Second Edition Pages 158-170	1
Reading lecture notes	1
Tutorial Exercise	
Solving Problems	
Preparation of Laboratory Report	

Recommended Self Learning Hours (Including Reading Time)	3

Week 4: OXY - FUEL GAS CUTTING
Introduction to oxy- acetylene cutting, explanation of basic principles, selection of cutting nozzles, use of correct gas pressures.

No of Lectures	1	1
No. of Tutorials	0	
No of Labs/Workshops/Practical's	3	
Field Trip(s)	0	

Readings:

F.J.M.Smith Basic Fabrication and Welding Engineering page 272-302	1
T.A.Gray & T. Mc Cormick1998 Metal Techniques Second Edition Pages 158-170	1
Reading lecture notes	1
Tutorial Exercise	
Solving Problems	
Preparation of Laboratory Report	

Recommended Self Learning Hours (Including Reading Time)	3

Week 5: BRAZING
Basic principles of brazing. Brazing techniques. Joining of dissimilar metals

No of Lectures	1	1

No. of Tutorials / classroom assessment # 1	0
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

F.J.M.Smith Basic Fabrication and Welding Engineering page 272-302 — 1

National Metals & Engineering Curriculum Metals Consortium Training Publications of Western Australia Manual Metal Arc Welding Resourse Notes — 1

Solving Problems

Preparation of Laboratory Report

Recommended Self Learning Hours (Including Reading Time)	2

Week 6: BRAZING- to be continued
6.1 Basic principles of brazing.
6.2 Brazing techniques. Joining of dissimilar metals

No of Lectures	1	1
No. of Tutorials / short test # 1	0	
No of Labs/Workshops/Practicals	3	
Field Trip(s)	0	

Readings:		
F.J.M.Smith Basic Fabrication and Welding Engineering page 272-302	1	
National Metals & Engineering Curriculum Metals Consortium Training Publications of Western Australia Manual Metal Arc Welding Resourse Notes Pages 55-71	1	
Reading lecture notes	1	
Solving Problems		
Preparation of Laboratory Report		
Recommended Self Learning Hours (Including Reading Time)	3	
Week 7: Introduction to GMAW and GTAW 7.1 Straight running bead in DH position on 6mm m/s plate		
No of Lectures	1	1
No. of Tutorials	0	
No of Labs/Workshops/Practical's	3	
Field Trip(s)	0	
Readings:		
F.J.M.Smith Basic Fabrication and Welding Engineering page 272-302	1	
National Metals & Engineering Curriculum Metals Consortium Training Publications of Western Australia Manual Metal Arc Welding Resourse Notes Pages 35-53	1	

Reading lecture notes	1	
Solving Problems		
Preparation of Laboratory Report		
Recommended Self Learning Hours (Including Reading Time)	3	

Week 8: GMAW and GTAW continued
8.1 Butt weld and Tee Fillet weld in D/H postion; on 6mm m/s plate

No of Lectures	1	1
No. of Tutorials	0	
No of Labs/Workshops/Practical's	3	
Field Trip(s)	0	

Readings:

F.J.M.Smith Basic Fabrication and Welding Engineering page 272-302	1
Griffin.Roden. Briggs 1977 Basic Oxyacetylene Welding Fourth Edition Pages 1-95	1
Reading lecture notes	1
Solving Problems	
Preparation of Laboratory Report	
Recommended Self Learning Hours (Including Reading Time)	3

Week 9:OXY-ACETYLENE
Personal safety, setting up of equipment, lighting up, setting of flame and run a pool of fusion.
Brazing procedures and applications.
Running beads 18G - 3mm m.s. plates, butt and fillet welds (oxy-acetylene).
Oxy-acetylene cutting and bevelling, free hands and with guides. Using roller guides for circle cutting and shape cutting.

No of Lectures	1	1
No. of Tutorials	0	
No of Labs/Workshops/Practical's	3	
Field Trip(s)	0	

Readings:

F.J.M.Smith Basic Fabrication and Welding Engineering page 272-302	1
Griffin.Roden. Briggs 1977 Basic Oxyacetylene Welding Fourth Edition Pages 1-95	1
Reading lecture notes	1
Solving Problems	
Preparation of Laboratory Report	

Recommended Self Learning Hours (Including Reading Time)	3

Week 10: OXY-ACETYLENE- to be continued
Personal safety, setting up of equipment, lighting up, setting of flame and run a pool of fusion.
Brazing procedures and applications.
Running beads on 1.6mm m.s. plates, butt and fillet welds (oxy-acetylene).
Oxy-acetylene cutting free hands and with guides. Using roller guides for circle cutting and shape cutting.

No of Lectures	1	1
No. of Tutorials / short test # 2	0	
No of Labs/Workshops/Practical's	3	
Field Trip(s)	0	

Readings:

F.J.M.Smith Basic Fabrication and Welding Engineering page 272-302	1
Griffin.Roden. Briggs 1977 Basic Oxyacetylene Welding Fourth Edition Pages 1-95	1
Reading lecture notes	1
Solving Problems	
Preparation of Laboratory Report	
Recommended Self Learning Hours (Including Reading Time)	3

Week 11: ARC WELDING.
Personal safety, setting up of equipment, striking the arc.
Single run fillets on 6mm m/s plates
Pad welds multiple beads on 6mm m/s plate in flat position. (arc welding).

No of Lectures	1	1
No. of Tutorials / classroom assessment # 2	0	
No of Labs/Workshops/Practical's	3	
Field Trip(s)	0	

Readings:

F.J.M.Smith Basic Fabrication and Welding Engineering page 272-302	1
National Metals & Engineering Curriculum Metals Consortium Training Publications of Western Australia Manual Metal Arc Welding Resource Notes Pages 27-33	1
Reading lecture notes	1
Solving Problems	
Preparation of Laboratory Report	
Recommended Self Learning Hours (Including Reading Time)	3

Week 12: ARC WELDING- <u>to be continued</u>
Personal safety, setting up of equipment, striking the arc..
Single run fillets on and 6mm m/s plates
Pad welds multiple beads on 6mm m/s plate in flat position. (arc welding).

No of Lectures	1	1
No. of Tutorials	0	
No of Labs/Workshops/Practical's	3	
Field Trip(s)	0	

Readings:

F.J.M.Smith Basic Fabrication and Welding Engineering page 272-302	1
National Metals & Engineering Curriculum Metals Consortium Training Publications of Western Australia Manual Metal Arc Welding Resource Notes Pages 27-33	1
Reading lecture notes	1
Solving Problems	
Preparation of Laboratory Report	

Recommended Self Learning Hours (Including Reading Time)	3

4.0 Assessment

Component	Weighting	Minimum Level
Assignments	10%	50%
Classroom Assessment	10%	
Short Tests	10%	
Practical Test	70%	
Final Examination	0%	0%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	Date	Weighting
Assignment 1	Week 6	5%
Assignment 2	Week 10	5%
Classroom Assessment 1	Week 5	5%
Classroom Assessment 2	Week 11	5%
Short Test 1	Week 6	5%
Short Test 2	Week 10	5%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the coursework and score at least 50% (ie. 50/100) It is highly recommended that students attend all tutorials/labs/workshops. The following grading system will be used:

Letter Grade Scale:

Grade	Marks	Grade Point Average
A+	90-100	4.33-5.00
A	85-89	4.00-4.27
A-	80-84	3.73-3.93
B+	75-79	3.33-3.60
B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0

CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

The academic conduct of the students is governed by the University Academic and Students Regulation (UASR). All students **must** obtain a copy of the UASR from the FNU academic office and familiarize themselves with all academic matters.
Should a student be dissatisfied with either the internal or external assessment, they can take the following steps to get redress of their grievance.

Internal Assessment: The student can refer the work back to the unit coordinator for checking and reassessment. Following this reassessment, if the student is still dissatisfied, the student may refer the work to the HOD. The HOD will then appoint another lecturer to examine the work and result will then stand.
Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

Plagiarism and Dishonest Practice Regulations

Plagiarism is taking another person's words or ideas and using them as if they were your own. It can be either deliberate or accidental. Plagiarism is taken very seriously in higher education. If even a small section of your work is found to have been plagiarised, it is likely that you will be assigned a mark of '0' for that assignment. In more serious cases, it may be necessary for you to repeat the course completely. In some cases, plagiarism may even lead to your expulsion from the university.

Actions that constitute plagiarism

1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.
2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.

3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

STAGE 3 UNIT DESCRIPTOR

FIJI NATIONAL UNIVERSITY

College of Engineering, Science & Technology

School of Mechanical Engineering

Certificate IV in Mechanical Plant Engineering

Lecturer:	**Semesa Lewanituva**
Other Lecturers:	TBA

PLM404 Trimester :3 Venue: Derrick Campus Title: Plant Operation & Maintenance Technology Credit Points **9**

LECTURES:	Students are to attend 1 x 1 hours of lectures per week.
TUTORIALS:	Students are to attend 1 x 1 hour tutorial class per week.
LABS:	Students are to attend 1 x 3 hour of Practical's.
SELF DIRECTED LEARNING	Students are to spend 5hrsX11wks, 4hrsX1wk and 8hrsX2wks for this unit.

CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the unit according to the following day and time; **(Day & Time: To be advised)**
PREREQUISITE:	The student must have completed PLM303, MEN305, MEN303,PLM406,PLM409
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:	Contact Hours	60
	Lectures	11
	Tutorials	11
	Labs/Workshops/Practical's	30
	Field Trips	8
	Self Directed Learning (during term)	59
	Self Directed Learning (Midterm Break)	8
	Self Directed Learning (Study & Exam Weeks)	8
	Total Recommended Learning Hours	135

1.0 Welcome

We welcome you to this Unit and hope that you will find it enriching and interesting.

1.1 Course Description

To enable the development of the intermediate knowledge and skills required for plant maintenance management.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.2. Show how, where and when the different types of maintenance would be used, justifying the circumstances for their use.

1.2.3. Recognize the importance of maintenance documentation, and produce examples of such documents used in a planned maintenance system.

1.2.4. Explain the importance of maintenance stores and the functions it plays in a maintenance system.

1.2.5. Demonstrate through annotated sketches and examples the principle of stock control.

1. 2.6. Produce a schedule of planned maintenance programme for the equipment of a typical mechanical engineering workshop.

1.2.7. Carry out cost analysis for the maintenance of a particular piece of an equipment.

2.0 Resources

2.1 Text

Compiled Notes

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition

Joel Levitt, Managing Factory Maintenance, First Edition

Terry Wireman, Inspection and Training for TPM

2.2 Supplementary Materials

Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: NEED FOR PLANT MAINTENANCE

Frequent plant failure. Need for frequent repairs. Lost production Productivity, planning and co-ordination of work.

Maintenance benefits. Financial. Technical. Organsational and human considerations.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition	1
Reading lecture notes (pp. 5 - 7)	2
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 2: TYPES OF MAINTENANCE

Basic Terms-Definitions and maintenance terminologies used in maintenance communications

The effect of maintenance costs on total production costs

Determine graphically the optimum level of maintenance from a given data.

Use local examples to show the above.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition	1
Reading lecture notes (pp. 9 - 15)	2
Doing tutorial exercise	2
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	5

Week 3: TYPES OF MAINTENANCE

Maintenance Classification Charts

"Bath Tub" (whole Life) curve of plant failure-Types of failure, Early, random and wear-out failure.

Fixed Time Maintenance

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition	1
Reading lecture notes (pp. 9 - 15)	2
Doing tutorial exercise	2
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	5

Week 4: TYPES OF MAINTENANCE

Condition-Based Maintenance

Points to be considered in formulating corrective maintenance.

Replacement instead of maintenance policy

Planned replacement of production units-advantages and disadvantages.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition	1
Reading lecture notes (pp. 9 - 11)	2
Assignment 1	2

Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	5

Week 5: PLANNED MAINTENANCE DOCUMENTATION AND CONTROL

Inventory. Asset Register. Maintenance Schedule Work Specifications

Format of the Asset Register and Inventory Sheet

No of Lectures	1
No. of Tutorials/Test1	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition	1
Reading lecture notes (pp. 36 - 38)	2
Doing tutorial exercise	2
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	5

Week 6: PLANNED MAINTENANCE DOCUMENTATION AND CONTROL

Relevant information required to be entered in the documents

Exercises in the preparation of the above documents

Work Order - Functions and Data Included

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition	1
Reading lecture notes (pp. 27 - 31)	2
Doing tutorial exercise	2
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	5

Week 7: PLANNED MAINTENANCE DOCUMENTATION AND CONTROL

Exercises in the preparation of the above documents

Work Order - Functions and Data Included

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3

Field Trip(s)	0

Readings:

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition	1
Reading lecture notes (pp. 27 - 38)	2
Doing tutorial exercise	2
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	5

Week 8: MAINTENANCE STORES CONTROL

Functions. Spares rationalization - benefits and procedures.

Requisition notes - information supplied. Choice of supplier - factors to be considered.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	3
Field Trip(s)	0

Readings:

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition	1
Reading lecture notes (pp. 39 - 43)	2
Assignment 1	2
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	5

Week 9: MAINTENANCE STORES CONTROL

Receipt of goods.

Stores layout- factors. Location. Identification of parts.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical Test 1	3
Field Trip(s)	0

Readings:

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition	1
Reading lecture notes	2
Doing tutorial exercise	2
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	5

Week 10: MAINTENANCE STORES CONTROL

Preservation of stock.
Hazards

Classification and coding

No of Lectures	1
No. of Tutorials/Test 2	1
No of Labs/Workshops/Practical Test 2	3
Field Trip(s)	0

Readings:

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition	1
Reading lecture notes (pp. 44 - 45)	2
Doing tutorial exercise	2
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	5

Week 11: PRINCIPLES OF STOCK CONTROL

Actions required. Purpose. Types - Fixed Order Quantity. Lead Time - when to place an order. Stock Control items.

Order Quantity. Economic Order Quantity - Determination, both, graphical and calculation.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops	0
Field Trip(s)	3

Readings:

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition	1
Reading lecture notes (pp. 47 - 50)	2
Doing tutorial exercise	2
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	5

Week 12: PRINCIPLES OF STOCK CONTROL

Order Quantity. Economic Order Quantity - Determination, both, graphical and calculation.

2 - Bin Stock Control and Periodic Review Systems - illustrations with examples.

Stock Records.

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	5

Readings:

Lindley. R. Higgins, Maintenance Engineering Handbook, Fifth Edition	1
Reading lecture notes (pp. 51 - 56)	2
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	4

4.0 Assessment

<table>
<tr><th>Component</th><th>Weighting</th><th>Minimum Level</th></tr>
<tr><td>Practical Assessment</td><td>30%</td><td>30%</td></tr>
<tr><td>Assignment</td><td>5%</td><td rowspan="3">20%</td></tr>
<tr><td>Class Exercises/Quizes</td><td>5%</td></tr>
<tr><td>Short Tests</td><td>10%</td></tr>
<tr><td>Final Examination</td><td>50%</td><td>50%</td></tr>
</table>

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	**Date**	**Weighting**
Assignment 1	Week 4	2.5%
Assignment 2	Week 9	2.5%

Class Exercise	Week 3	2.5%
Class Exercise	Week 8	2.5%
Class Test 1	Week 5	5%
Class Test 2	Week 10	5%
Practical Test 1	Week 9	15%
Practical Test 2	Week 10	15%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. The following grading system will be used:

Letter Grade Scale:

Grade	Marks	Grade Point Average
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B+	75-79	3.33-3.60
B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27

C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

The academic conduct of the students is governed by the University Academic and Students Regulation (UASR). All students **must** obtain a copy of the UASR from the FNU academic office and familiarize themselves with all academic matters.

Should a student be dissatisfied with either the internal or external assessment, they can take the following steps to get redress of their grievance.

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1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.
2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY
College of Engineering, Science & Technology
School of Mechanical Engineering
Certificate IV in Mechanical Plant Engineering

Lecturer:	Kitione S Fesaitu
Other Lecturers:	Semesa Lewanituva and Atunaisa Lewenilovo

PLM403 Trimester : 3 Venue: Derrick Campus Title: Plant Engineering Technology Credit Points 9

LECTURES:	Students are to attend 1 x 1 hours of lectures per week.
TUTORIALS:	Students are to attend 1 x 1 hour tutorial class per week.
LABS:	Students are to attend 1 x 5 hours of Labs per week.
SELF DIRECTED LEARNING	Students are to spend about 3hrs X 11wks and 2hrs X 1wk, 8hrs X 2wks for this unit.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the unit according to the following day and time; **(Day & Time: To be advised)**
PREREQUISITE:	The student must have completed PLM303, PLM406,PLM409,MEN305

E-INFORMATION: All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:

Contact Hours	84
Lectures	11
Tutorials	11
Labs/Workshops/Practical's	50
Field Trip	12
Self Directed Learning (during term)	35
Self Directed Learning (Midterm Break)	8
Self Directed Learning (Study & Exam Weeks)	8
Total Recommended Learning Hours	135

1.0 Welcome

We welcome you to this Unit and hope that you will find it enriching and interesting.

1.1 Course Description

The purpose of this unit is to enable the development of intermediate knowledge and skills for studying related units in plant engineering and the concepts of Plant Technology

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.1. Specify rotodynamic and reciprocating pumps for typical application.1.2.2. Demonstrate an understanding of water treatment for domestic and industrial use.1.2.3. Identify and prevent the danger of pollution from industrial waste.1.2.4. Demonstrate knowledge of construction, application and maintenance of valves and pipelines.1.2.5. Understand the basics of industrial instrumentation, application, calibration and maintenance.1.2.6. Produce a schedule of planned maintenance programme for the equipment of a typical mechanical engineering workshop.
1.2.7. Carry out cost analysis for the maintenance of a particular piece of equipment. (Pumps and Valves) 1.2.8. Dismantle, examine, service / repair and re-assemble machines and identify components for different types of maintenance schedule.

2.0 Resources

2.1 Text

a). Nancy riikonen and Clay Jones, 1992,Industrial waste water control, Technomic Publishing Company Inc.

b). Harry m.Freeman, 1995, Industrila Pollution prevention, McGraw-Hill Inc.

c).Operation of Pumps from the Indian Institute for Production Management by A. Jayprakash d). Operation and Installation of valves and pipelines from the Indian Institute for Production Management by A. Jayprakash

2.2 Supplementary Materials

Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: PUMPS

a). Classification of pumps dynamic centrifugal and positive displacement;
b).Types of lobe, gear internal external, piston, bucket, vane, rotor, mono, jet, axial flow and centrifugal pumps.
c). Repair hydraulic, pneumatic pumps and motors.

No of Lectures 1

No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Operation of Pumps from the Indian Institute for Production Management by A. Jayprakash 1
Operation and Installation of valves and pipelines from the Indian Institute for Production Management by A. Jayprakash (39-55-93)

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	3

Week 2: PUMPS

a). Classification of pumps dynamic and positive displacement.;
- Checklist for pump choice
- Installation of pumps

b). Repair and maintain hydraulic pumps systems.

No of Lectures	1
No. of Tutorials	1

No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Operation of Pumps from the Indian Institute for Production Management by A. Jayprakash 1
Operation and Installation of valves and pipelines from the Indian Institute for Production Management by A. Jayprakash (39-55-93)

Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	3

Week 3: PUMPS

a). Classification of pumps dynamic and positive displacement.;
- pump faults, and maintenance.
- Priming pumps.

b). Dismantle, examine, repair and re-assemble vane, roots, piston, and screw compressors.
c). Layout compressors, pumps and alignment of couplings using the preliminary method and dial test indicator.

No of Lectures	1
No. of Tutorials	1

No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Operation of Pumps from the Indian Institute for Production Management by A. Jayprakash 1
Operation and Installation of valves and pipelines from the Indian Institute for Production Management by A. Jayprakash (39-55-93)

Reading lecture notes	0
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	3

Week 4: WATER TREATMENT

a). Classification - Rain, Surface, Well.
b). Properties of soft and hard water

No of Lectures	1
No. of Tutorials	1

No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

a). Industrial waste water control by Nancy riikonen and Clay Jones (Pages 94-111)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	3

Week 5: WATER TREATMENT

c). Domestic Water Treatment
d). Distillation, Filtration, Boiling, Aeration and Chlorination

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

a). Industrial waste water control by Nancy riikonen and Clay Jones (Pages 94-111)	0

Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	3

Week 6: WATER TREATMENT

e). Industrial - Crystallization and Precipitation f). Coagulation and ion exchange process. g).Chemical water treatment

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

a). Industrial waste water control by Nancy riikonen and Clay Jones (Pages 94-111)	0
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	3

Week 7: POLLUTION

a). Danger of pollution from waste products.
b). Danger of pollution from fumes and gasses.

No of Lectures	1
No. of Tutorials/Test1	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

b). Industrial Pollution prevention by Harry m. Freeman Pages (111-119)	0
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	3

Week 8: POLLUTION

c). Risk of explosion and lung damage from dusty environments
d). Effects of noisy environments

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

b). Industrila Pollution prevention by Harry m.Freeman Pages (111-119)	0
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1

Recommended Self Learning Hours (Including Reading Time)	3

Week 9: POLLUTION

e). Safe working noise level, and noise reduction.
f). Ozone layer depletion

No of Lectures	1

No. of Tutorials	1
No of Labs/Workshops/Practical's	0
Field Trip(s)	5

Readings:

b). Industrial Pollution prevention by Harry m. Freeman Pages (111-119)	0
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	3

Week 10: VALVES AND PIPELINES

a). Construction and maintenance.
b). Types - globe, gate, needle, ball, solenoid, butterfly and pressure regulating valves

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	7

Readings:

Operation of Pumps from the Indian Institute for Production Management by A. Jayprakash	1
Operation and Installation of valves and pipelines from the Indian Institute for Production Management by A. Jayprakash (Pages 4-38)	
Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	3

Week 11: VALVES AND PIPELINES

c). Control - Direct metallic expansion, Liquid expansion, Vapour pressure, and Temperature.
d). Valve Materials - advantages and disadvantages, types, and property requirements.

No of Lectures	1
No. of Tutorials/Test 2	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Operation of Pumps from the Indian Institute for Production Management by A. Jayprakash	1
Operation and Installation of valves and pipelines from the Indian Institute for Production Management by A. Jayprakash (Pages 4-38)	

Reading lecture notes	0
Doing tutorial exercise	1
Practical preparation	1
Recommended Self Learning Hours (Including Reading Time)	3

Week 12: VALVES AND PIPELINES

e). Methods of pipe, color coding, valve symbols
f). Design and Fixed factors

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Operation of Pumps from the Indian Institute for Production Management by A. Jayprakash 1
Operation and Installation of valves and pipelines from the Indian Institute for Production Management by A. Jayprakash.
(Pages 4-38)

Reading lecture notes	1
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

4.0 Assessment

Component	Weighting	Minimum Level
2 Assignment	10%	50%
2 Class Exercises/Quizes	5%	
4 Laboratory exercises	15%	
2 Short Tests	20%	
Final Examination	50%	50%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	Date	Weighting
Assignment 1	Week 4	5.0%
Assignment 2	Week 6	5.0%
Laboratory exercises	week 1-8 and 11-12	15.0%
Class Test 1	Week 7	10%
Class Test 2	Week 11	10%
Quiz-1 and 2	Week 4,8	5%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendence of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. The following grading system will be used:

Letter Grade Scale:

Grade	Marks	Grade Point Average
A+	90-100	4.33-5.00
A	85-89	4.00-4.27
A-	80-84	3.73-3.93
B+	75-79	3.33-3.60
B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0

NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

The academic conduct of the students is governed by the University Academic and Students Regulation (UASR). All students **must** obtain a copy of the UASR from the FNU academic office and familiarize themselves with all academic matters.

Should a student be dissatisfied with either the internal or external assessment, they can take the following steps to get redress of their grievance.

Internal Assessment: The student can refer the work back to the unit coordinator for checking and reassessment. Following this reassessment, if the student is still dissatisfied, the student may refer the work to the HOD. The HOD will then appoint another lecturer to examine the work and result will then stand.

Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

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Actions that constitute plagiarism

1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.
2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.
3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY

College of Engineering, Science & Technology

School of Mechanical Engineering

Certificate IV in Mechanical Plant Engineering

Lecturer:	Atunaisa Lewenilovo
Other Lecturers:	TBA

PLM 405 Trimester : 3 Venue: Derrick Title: STEAM PLANT Credit Points	10

LECTURES:	Students are to attend 1 x 1 hours of lectures per week.	
TUTORIALS:	Students are to attend 1 x 1 hours tutorial class per week.	
PRACTICAL:	Students are to attend 1 x 4 hours of Labs per week.	
SELF DIRECTED LEARNING	Students are to spend 5hrsX6wks, 7hrsX1wk, 4hrsX1wk 6hrsX2wks8hrsX2wks, for this course.	
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the course according to following times; (TBA)	
PREREQUISITE:	The student must have completed PLM303, PLM406,PLM409,MEN305	
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.	
TOTAL LEARNING HOURS:	Contact Hours	72
	Lectures	10
	Tutorials	10
	Labs/Workshops/Practical's	40
	Field Trip(s)	12
	Self Directed Learning (during term)	78
	Self Directed Learning (Mid-Term Break)	8
	Self Directed Learning (Study & Exam Weeks)	8
	Total Recommended Learning Hours	150

1.0 PURPOSE

The purpose of this unit is to enable the participant to develop the basic knowledge and skills to operate and carry basic maintenance on a small steam power plant

1.1 PERFORMANCE CRITERIA

Assignments and practical tasks should be designed to the prescribed standards.
Written or oral tests and practical should reflect stated objectives.

1.2 Learning Targets/Outcomes

As a result of successfully completing this module the student will be able to:

1.2. 2. Produce diagrams to illustrate the principles of a conventional steam plant including the mountings as legislated in the statutory requirements for boilers.

1.2.3 Carry out basic maintenance work on boilers and their associated accessories
1.2.4 Draw up a checklist for the routine inspection of boilers.
1.2.5 Carry out test procedures to assess the reliability of safety devices fitted to boilers.

1.2.6 Safely run a small package boiler and competently bank the fires during an emergency.

1.2.7. To understand the implications of using impure feed water for steam generation

2.0 Resources

2.1 Text

1. Boiler Operation Engineering: Questions and Answers 2nd Edition By: P. Chattopadhyay

2. International site for spirax sarco

3. Boiler operations by M P Murgai Ram Chandra

4. Notes for Boiler Operators Part 1 and 2 Combined Edition By A.Darnley

2.2 Supplementary Materials

1. Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: Title: 1 BASIC TERMS AND DEFINITIONS

Heat, temperature pressure, work, power, specific heat capacity, enthalpy. Energy – chemical, kinetic, potential, pressure, mechanical and potential energy. Conversion of one form of energy to another, e.g. chemical energy to electrical Energy(.Slide

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Boiler Operation Engineering: Questions and Answers 2nd Edition By: P. Chattopadhyay (Pages 1-10) 2. Notes for Boiler Operators Part 1 and 2 Combined Edition By A.Darnley (Pages 1-8)

Reading lecture notes	3
Solving Problems	1
Preparation of Laboratory Report	1

Recommended Self Learning Hours (Including Reading Time)	5

Week 2: Title: INTRODUCTION TO STEAM

1. What is steam?
   Why use steam?
   Why so widely used in industries?
   How steam is formed?
   Advantages and disadvantages of steam used as a source of power over
   Alternatives of power production.
   The formation of steam

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Boiler Operation Engineering: Questions and Answers 2nd Edition By: P. Chattopadhyay (Page 1-19) 2. Notes for Boiler Operators Part 1 and 2 Combined Edition By A.Darnley (Pages 8-10)

Reading lecture notes	3
Solving Problems	1
Preparation of Laboratory Report	1

Recommended Self Learning Hours (Including Reading Time)	5

Week 3: Title: BOILERS AND STEAM PLANT

1.Early development of boilers – haystack, scotch, economic, Lancashire Wet-back and dry-back boilers. Fire-tube and water-tube boilers – differences
2.Application of fire-tube and water-tube boilers
3.Typical boiler layout and parts.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Notes for Boiler Operators Part 1 and 2 Combined Edition By A.Darnley (Pages 10-25)

Reading lecture notes	3
Solving Problems	1
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 4: BOILER MOUNTINGS

1. State statutory requirement relating to a boiler and its mountings.
2. Identification and location of boiler mountings.
3. Construction, operation, functions, and maintenance of the following boiler

Class Test 1	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

2. Notes for Boiler Operators Part 1 and 2 Combined Edition By A.Darnley (Pages37-44)

Reading lecture notes	3
Solving Problems	1
Preparation of Laboratory Report	1

Recommended Self Learning Hours (Including Reading Time)	5

Week 5: Title: Boiler Mountings:

1. Gauge glasses – simple and composite types, procedure for blow-down
2. Pressure Gauge – Bourdon U-tube type. Hydrostatic test and advantages.
3. Safety valve – dead weight, spring loaded and high lift
4. Blow Down Valve – Function and types
5. Feed check valve – purpose and construction.
6. Stop valve – purpose, Safety if connected to a common range.
7. Water Hammer – what is it and how is it produced in a steam pipe? Danger of
8. Water hammer. Method of reducing water hammer.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Boiler Operation Engineering: Questions and Answers 2nd Edition By: P. Chattopadhyay (Page 33-56)

Reading lecture notes	3
Solving Problems	1
Assignment 1	3

Recommended Self Learning Hours (Including Reading Time)	7

Week 6: Title: STEAM PLANT LAYOUT

1. Closed-feed cycle and Open-feed cycle – application and advantage of one over the other.
2. Disadvantage of one against the other.
3. Sketch of layout of both types of cycles. Cycles appropriate for process work and power production.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Boiler Operation Engineering: Questions and Answers 2nd Edition By: P. Chattopadhyay 2. Boiler operations by M P Murgai Ram Chandra (Pages 17-27)

Reading lecture notes	3
Solving Problems	
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	4

MID TRIMESTER BREAK

No of Lectures	0

No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	0

Readings:

STUDY	8
Recommended Self Learning Hours (Including Reading Time)	8

WEEK 7 Title : STEAM CONDITIONING

. Concept of 'wet' and 'dry' steam – production, advantages and disadvantages
Construction and function of the following:-
Steam Traps – Balanced pressure type, Liquid expansion, Bi-metallic, Float and Lever type and inverted bucket.
Need for a relief valve downstream a pressure regulating valve.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Boiler Operation Engineering: Questions and Answers 2nd Edition By: P. Chattopadhyay (Pages 56-68)

Reading lecture notes	3
Solving Problems	1

Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 8: Title: BOILER CLEANING

How fouling of tubes occur. Procedure for cleaning fire-tube and water-tube boilers.
Chemical cleaning of water side of boilers.
Soot-blowers for cleaning fire-side of water-tube boilers.
Need for operating soot-blowers in a pre-determined sequence.
Collecting 'fly' ash from boilers using cyclone separators and electro-static precipitators.

Class Test 2	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Notes for Boiler Operators Part 1 and 2 Combined Edition By A.Darnley (Pages 62-64)

Reading lecture notes	3
Solving Problems	1
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	5

Week 9: Title: FUEL BURNING AND AIR SUPPLY EQUIPMENT

Construction, operation and maintenance of the following types:- Chain grate stockers, inclined grate stockers Pressure atomization and spinning cup oil burners. Need for correct amount of air supply. Methods of air supply – natural, mechanical, induced and balanced draught

No of Lectures	1
No. of Tutorials	1
Laboratory/Practical Test 1	4
Field Trip(s)	0

Readings:

1. Boiler operations by M P Murgai Ram ChandraFNU Samabula(Pages 28-96) 2. Notes for Boiler Operators Part 1 and 2 Combined Edition By A.Darnley (Pages 72-78)

Reading lecture notes	3
Solving Problems	1
Preparation of Laboratory Report	1

Recommended Self Learning Hours (Including Reading Time) 5

Week 10: Title 1:BOILER OPERATION

Start-up and shut-down procedure for a small boiler plant
List steam plant emergency procedures.

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Field Trip(s)	6

Readings:

1. Boiler Operation Engineering: Questions and Answers 2nd Edition By: P. Chattopadhyay

Reading lecture notes	3
Assignment 2	3
Preparation of Laboratory Report	0

Recommended Self Learning Hours (Including Reading Time)	6

Week 11: Title: BOILER OPERATION

Preparation of a small boiler plant for 'cold' and 'hot' inspection by the Inspector of Factories. Actions.

Fulton Boiler Manual (Pages 18-36)

No of Lectures	0
No. of Tutorials	0
Laboratory/Practical Test 2	0
Field Trip(s)	6

Readings:

1. Fulton Boiler Manual (Pages 18-36)

Reading lecture notes	4
Solving Problems	
Preparation of Laboratory Report	0
Recommended Self Learning Hours (Including Reading Time)	4

Week 12: Title 1: BOILER WATER TREATMENT

Classification of impurities in feed water and its effect.
Aim of boiler water treatment
Temporary and permanent hardness and their remedies.
The De Aerator and how it drives off the dissolved gases.

Class Test 3	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

1. Boiler Operation Engineering: Questions and Answers 2nd Edition By: P. Chattopadhyay 2.International site for spirax sarco (slides 1-10)

Reading lecture notes	3
Solving Problems	2
Preparation of Laboratory Report	1
Recommended Self Learning Hours (Including Reading Time)	6
STUDY	8
Recommended Self Learning Hours (Including Reading Time)	8

4.0 Assessment

Component	**Weighting**	**Minimum Level**
Assignment	10%	50%
Class Exercises		
Laboratory/Practical Test	25%	
Short Test	15%	
Final Examination	50%	50%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	Date	Weighting
Assignment 1	Week5	5%
Assignment 2	Week 10	5%
Class Test 1	Week 4	5%
Class Test 2	Week 8	5%
Class Test 3	Week 12	5%
Laboratory/Practical Test 1	Week 9	10%
Laboratory/Practical Test 2	Week 11	15%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. It is highly recommended that students attend all tutorials/labs/workshops. The following grading system will be used:

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B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60

C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

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4. Including a graph, table or picture from a source without proper citation.
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6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY

College of Engineering, Science & Technology

School of Mechanical Engineering

Certificate IV in Mechanical Plant Engineering

Lecturer:	**Semesa Lewanituva**
Other Lecturers:	**Kitione S Fesaitu / Atunaisa Lewenilovo**

PLM408 Trimester :3 Venue: Derrick Campus Title: Mechanical Power Transmission Credit Points 9

LECTURES:	Students are to attend 1 x 1 hours of lectures per week.
TUTORIALS:	Students are to attend 1 x 1 hour tutorial class per week.
LABS:	Students are to attend 1 x 5 hour of Practical's.
SELF DIRECTED LEARNING	Students are to spend about 3hrsX11wks, 2hrsX1wk, and 8hrsX2wks for this unit.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the unit according to the following day and time; **(Day & Time: To be advised)**
PREREQUISITE:	The student must have completed PLM303, MEN305, MEN303
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:		
	Contact Hours	84
	Lectures	11
	Tutorials	11
	Labs/Workshops/Practical’s	55
	Field Trip	7
	Self Directed Learning (during term)	35
	Self Directed Learning (Midterm Break)	8
	Self Directed Learning (Study & Exam Weeks)	8
	Total Recommended Learning Hours	135

1.0 Welcome

We welcome you to this Unit and hope that you will find it enriching and interesting.

1.1 Course Description

To enable the development of the elementary knowledge and skills required for assembling power trains.

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.1. Use annotated illustrations to demonstrate power transmission units used in modern engineering such as gears, belt drives, brakes, chain devices, clutches

1.2.2. Select drive specifications from catalogues using above units for various applications

1.2.3. Identify types of deterioration in power transmission devices.

1.2.4. Carry out workshop exercises to demonstrate an understanding of the adjustments for accurate performance of power transmission devices

2.0 Resources

2.1 Text

2.1.1. Doug Bruce, Mechanical Power Transmission , Training Publication of Australia

2.1.2. M. J. Neale, Drives and Seals (Tribology Handbook)

2.2 Supplementary Materials

Supplementary notes will either be given during the lectures or placed on class share.

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1:BELT DRIVES

Advantages, disadvantages and application, v-belt, toothed belts, flat belts, timing belts, adjustable belts.

Materials, fastening and tensioning.

Belt tensioning devices, jockey wheel, adjusting nut and spring. Belt and pulley speeds

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Doug Bruce, Mechanical Power Transmission , National Metal and Engineering Curriculum (pp.7 - 13)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	3

Week 2:BELT DRIVES

Angle of wrap, slippage

Alignment of pulleys and measurement of tension

Use of manuals

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Doug Bruce, Mechanical Power Transmission , National Metal and Engineering Curriculum (pp. 14 - 18)	1
Reading lecture notes (pp. 6 - 7)	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	3

Week 3: CHAIN DRIVES

Advantages, disadvantages, uses and application for plain, roller and silent chain drives.

Chain life, measurements of chain wear, sprocket alignment, selection

No of Lectures	1
No. of Tutorials	1

No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Doug Bruce, Mechanical Power Transmission , National Metal and Engineering Curriculum (pp. 37 - 44)	1
Reading lecture notes (pp. 16 - 20)	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	3

Week 4: CHAIN DRIVES

Chain life, measurements of chain wear, sprocket alignment, selection

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Doug Bruce, Mechanical Power Transmission , National Metal and Engineering Curriculum (pp. 46 - 50)	1
Reading lecture notes (pp. 21 - 23)	1
Doing tutorial exercise	1
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	3

Week 5: GEARS

Types, applications, advantages, disadvantages and uses; spur, helical, bevel, worm, rack

Wear, spalling, abrasion, chipping and burning and identify method of prevention

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Doug Bruce, Mechanical Power Transmission , National Metal and Engineering Curriculum (pp. 63 - 80)	1
Reading lecture notes (pp. 29 - 38)	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	3

Week 6: GEARS

Wear, spalling, abrasion, chipping and burning and identify method of prevention

Terms involutes gearing, speed, calculations

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Doug Bruce, Mechanical Power Transmission , National Metal and Engineering Curriculum (pp. 71 - 80)	1
Reading lecture notes (pp. 33 - 38)	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	3

Week 7: COUPLINGS

Rigid couplings: solid flange, split muff, sleeves.

Flexible couplings: pin and rubber bushings, flexible disc, gear, chain, spring, spider, barrel.

No of Lectures	1
No. of Tutorials/Test 1	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Doug Bruce, Mechanical Power Transmission , National Metal and Engineering Curriculum (pp. 103 - 108)	1
Reading lecture notes (pp. 47 - 50)	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	3

Week 8: COUPLINGS

Flexible couplings: pin and rubber bushings, flexible disc, gear, chain, spring, spider, barrel.

Coupling misalignment, parallel, angular, performance and wear. Coupling alignment techniques, selection.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Doug Bruce, Mechanical Power Transmission , National Metal and Engineering Curriculum (pp. 104 - 108)	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	3

Week 9: CLUTCHES

Advantages, disadvantages, principles of operation.

Positive clutches: mechanical jaw, square jaw (dog), spiral jaw

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical's	0

Field Trip(s)	7

Readings:

Doug Bruce, Mechanical Power Transmission , National Metal and Engineering Curriculum (pp. 125 - 131)	1
Reading lecture notes (56 - 59)	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	3

Week 10: CLUTCHES

Friction clutches: single plate, multi plate.

Damage, heat, lubrication, adjustment.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Doug Bruce, Mechanical Power Transmission , National Metal and Engineering Curriculum (p. 125 - 131)	1
Reading lecture notes	1

Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	3

Week 11: VARIABLE SPEED DRIVES

Advantages, disadvantages, principles of operation; double cone pulley, stepped cone pulley, quick-change gearbox, infinitely variable speed drives.

No of Lectures	1
No. of Tutorials	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Doug Bruce, Mechanical Power Transmission , National Metal and Engineering Curriculum	1
Reading lecture notes	1
Doing tutorial exercise	1
Practical preparation	0
Recommended Self Learning Hours (Including Reading Time)	3

Week 12: BRAKES

Types of Brakes.

Advantages, disadvantages, principle of operation, maintenance.
Brake lining materials; mechanical hydraulic, electrical and pneumatic brake actuating.
Faults, brake fade, and fade resistance.

No of Lectures	1
No. of Tutorials/Test 2	1
No of Labs/Workshops/Practical's	5
Field Trip(s)	0

Readings:

Doug Bruce, Mechanical Power Transmission , National Metal and Engineering Curriculum	1
Reading lecture notes (pp. 61 - 62)	1
Doing tutorial exercise	0
Practical preparation	0

Recommended Self Learning Hours (Including Reading Time)	2

4.0 Assessment

Component	**Weighting**	**Minimum Level**
Practical Assessment	50%	50%
Assignment	5%	20%

Class Exercises/Quizzes	5%	
Short Tests	10%	
Final Examination	30%	30%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	**Date**	**Weighting**
Assignment 1	Week 4	2.5%
Assignment 2	Week 9	2.5%
Class Test 1	Week 7	5%
Class Test 2	Week 12	5%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. The following grading system will be used:

Letter Grade Scale:

Grade	**Marks**	**Grade Point Average**
A+	90-100	4.33-5.00
A	85-89	4.00-4.27
A-	80-84	3.73-3.93

B+	75-79	3.33-3.60
B	70-74	3.00-3.27
B-	65-69	2.67-2.93
C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

Dissatisfaction with Assessment

The academic conduct of the students is governed by the University Academic and Students Regulation (UASR). All students **must** obtain a copy of the UASR from the FNU academic office and familiarize themselves with all academic matters.

Should a student be dissatisfied with either the internal or external assessment, they can take the following steps to get redress of their grievance.

Internal Assessment: The student can refer the work back to the unit coordinator for checking and reassessment. Following this reassessment, if the student is still dissatisfied, the student may refer the work to the HOD. The HOD will then appoint another lecturer to examine the work and result will then stand.

Final Exam: The student can apply for re-check of the grade as per the procedures laid down in the UASR.

Plagiarism and Dishonest Practice Regulations

Plagiarism is taking another person's words or ideas and using them as if they were your own. It can be either deliberate or accidental. Plagiarism is taken very seriously in higher education. If even a small section of your work is found to have been plagiarized, it is likely that you will be assigned a mark of '0' for that assignment. In more serious cases, it may be necessary for you to repeat the course completely. In some cases, plagiarism may even lead to your expulsion from the university.

Actions that constitute plagiarism

1. Downloading and turning in a paper from the Web including a Web page or a paper from an essay writing service.

2. Copying and pasting phrases, sentences, or paragraphs into your paper without showing a quotation and adding proper citation.

3. Paraphrasing or summarizing a source's words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.

5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.

FIJI NATIONAL UNIVERSITY

College of Engineering, Science & Technology

School of Mechanical Engineering

Certificate IV in Mechanical Plant Engineering

Lecturer: Atunaisa Lewenilovo

Other Lecturers: TBA

MEN 419 Trimester : 3 Venue: Derrick Title: AutoCAD and Introduction to Solid Works Credit Points 8.00

LECTURES: Students are to attend 1 x 1 hours of lectures per week.

TUTORIALS:

LABS: Students are to attend 1 x4 hours of Labs per week.

SELF DIRECTED LEARNING	Students are to spend about 3-4 hours per week for this course.
CONSULTATION TIME	Students can consult the Lecturer to discuss issues relating to the course according to following times; (TBA)
PREREQUISITE:	The student must have completed MEN303, CIN102, MEN418
E-INFORMATION:	All pertinent information relating to the course shall be posted on Moodle, Class shares and emails. Students are required to check emails regularly for communication from the lecturer.

TOTAL LEARNING HOURS:	Contact Hours	60
	Lectures	12
	Tutorials	0
	Labs/Workshops/Practical's	48
	Field Trip(s)	0
	Self Directed Learning (during term)	60
	Self Directed Learning (Mid-Term Break)	12
	Self Directed Learning (Study & Exam Weeks)	12
	Total Recommended Learning Hours	120

1.0 Welcome

We welcome you to this exciting unit which extends the students' knowledge on relevant engineering applications.

1.1 Course Description

To extend the students knowledge on relevant engineering applications in the field of Computer Aided Design (CAD)

1.2 Learning Targets/Outcomes

On successful completion of this course, students will be able to:

1.2.1. Design 3-D parametric CAD models using available parametric features, select and apply suitable materials to the model

1.2.2. Assemble engineering components in a CAD model “bottom up” and “top down”.

1.2.3. Control the CAD model by configurations, design tables and equations for a variety of specifications

1.2.4. Render CAD models (virtual photograph) for use in professional documentation such as a proposals and brochures.

1.2.5. Create orthographic and isometric drawings and related section, detail and exploded views in accordance to Australian Standard (AS1100) and generate bill of materials and 3D animation of CAD models

1.2.6. Determine necessary constraints and simulate dynamic mechanisms (assemblies).

2.0 Resources

2.1 Text

Software manuals relevant to current applications (supplied on CD-Rom)

2.2 Supplementary Materials

1. Supplementary notes will either be given during the lectures or placed on class share.

2. Solid Works “Getting Started”, user manual and tutorial

3. COSMOS Motion user manual and tutorial

2.3 Class Shares

Notices & Announcements, Unit descriptor, Assessment and Assessment details, and supplementary notes (details) will be provided.

3.0 Course Content and Reading References

Week 1: Drawings Parts:

1. Parts: View options, sketch planes, sketching, relationships, feature creation, concept of parametric modeling and design intent, symmetry

2. Parts: Extrude, cut, shell, fillet, chamfer, system and document setting options

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical’s	4
Field Trip(s)	0

Readings:

Solid Works “Getting Started” and “User Manual”

Reading lecture notes	1
Solving Problems	2
Preparation of practical reports	
Recommended Self Learning Hours (Including Reading Time)	3

Week 2: Assemblies:

1. Assemblies: mate relationships, add and edit components, fix and float parts, constraints, configurations
2. Drawings: Basic drawing creation, templates, inserts model items, text entry, drawing created to AS1100 Standard.

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Solid Works "Getting Started" and "User Manual"

Reading lecture notes	1
Solving Problems	2
Preparation of practical reports	

Recommended Self Learning Hours (Including Reading Time)	3

Week 3:Drawings Parts:

1. Parts: copy in sketch, mirror feature, introduction to loft and sweep
2. Assemblies: Bottom up assembly, create new, add and edit components, explode, collapse

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4

Field Trip(s)	0

Readings:

Solid Works "Getting Started" and "User Manual"

Reading lecture notes	1
Solving Problems	2
Preparation of practical reports	

Recommended Self Learning Hours (Including Reading Time)	3

Week 4: Drawings Parts :

1. Drawings: section-, auxiliary-, detail view creation, annotated notes, welding symbols, tolerances, printing, production of 'e-drawing'
2. Drawings: using spreadsheets to drive the model, bill of materials, balloons

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Solid Works "Getting Started" and "User Manual"

Reading lecture notes	1
Solving Problems	2
Preparation of practical reports	
Recommended Self Learning Hours (Including Reading Time)	3

Week 5: Drawings Parts :

1. Drawings: section-, auxiliary-, detail view creation, annotated notes, welding symbols, tolerances, printing, production of 'e-drawing'
2. Drawings: using spreadsheets to drive the model, bill of materials, balloons

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Solid Works "Getting Started" and "User Manual"

Reading lecture notes	1
Solving Problems	2
Preparation of practical reports	

Recommended Self Learning Hours (Including Reading Time)	3

Week 6: Drawings Parts :

1. Drawings: section-, auxiliary-, detail view creation, annotated notes, welding symbols, tolerances, printing, production of ‘e-drawing’
2. Drawings: using spreadsheets to drive the model, bill of materials, balloons

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical’s	4
Field Trip(s)	0

Readings:

COSMOS Motion “Manual” and “Tutorial”

Reading lecture notes	1
Assignment 1	2
Preparation of practical reports	

Recommended Self Learning Hours (Including Reading Time)	3

MID TRIMESTER BREAK

No of Lectures	0
No. of Tutorials	0
No of Labs/Workshops/Practical’s	0
Class Test 1	0

Readings:

Solid Works “Getting Started” and “User Manual”	
Reading lecture notes	2
Project 1	10
Preparation of practical reports	
Recommended Self Learning Hours (Including Reading Time)	12

Week 7: Drawings Parts :

1. Drawings: section-, auxiliary-, detail view creation, annotated notes, welding symbols, tolerances, printing, production of ‘e-drawing’
2. Drawings: using spreadsheets to drive the model, bill of materials, balloons

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical’s	4
Field Trip(s)	0

Readings:

Solid Works “Getting Started” and “User Manual”	
Reading lecture notes	1
Assignment 1	2
Preparation of practical reports	
Recommended Self Learning Hours (Including Reading Time)	3

Week 8: Motion analysis:

1. Lecture on a simple linkage (case study)

2. Tutorial motion analysis

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's Class Test 1	4
Field Trip(s)	0

Readings:

Solid Works "Getting Started" and "User Manual"

Reading lecture notes	1
Solving Problems	2
Preparation of practical reports	
Recommended Self Learning Hours (Including Reading Time)	3

Week 9: Assembly

1. Top down assembly: design sketches in assembly, in context modeling, external references
2. Tutorial: top down assembly approach

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4

Field Trip(s)	0

Readings:

Solid Works "Getting Started" and "User Manual"

Reading lecture notes	1
Solving Problems	2
Preparation of practical reports	

Recommended Self Learning Hours (Including Reading Time)	3

Week 10: Assembly

1. Top down assembly: design sketches in assembly, in context modeling, external references
2. Tutorial: top down assembly approach

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Field Trip(s)	0

Readings:

Solid Works "Getting Started" and "User Manual"

Reading lecture notes	1

Solving Problems	2
Preparation of practical reports	
Recommended Self Learning Hours (Including Reading Time)	3

Week 11: Sheet metal parts

1. Introduction to sheet metal parts: design methods, bends, corner breaks, auto relieves, flat pattern, forming tools
2. Tutorial: sheet metal

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's	4
Class Test 1	0

Readings:

Solid Works "Getting Started" and "User Manual"	
Reading lecture notes	1
Assignment 2	2
Preparation of practical reports	
Recommended Self Learning Hours (Including Reading Time)	3

Week 12: Sheet metal parts

1. Introduction to sheet metal parts: design methods, bends, corner breaks, auto relieves, flat pattern, forming tools
2. Tutorial: sheet metal

No of Lectures	1
No. of Tutorials	0
No of Labs/Workshops/Practical's Class Test 2	4
	0

Readings:

COSMOS Motion "Manual" and "Tutorial"

Reading lecture notes	1
Assignment 2	2
Preparation of practical reports	

Recommended Self Learning Hours (Including Reading Time)	3

STUDY BREAK

No of Lectures	0

No. of Tutorials	0
No of Labs/Workshops/Practical's	0
Class Test 1	0

Readings:

Solid Works "Getting Started" and "User Manual"	
Reading lecture notes	2
Project 2	10
Preparation of practical reports	
Recommended Self Learning Hours (Including Reading Time)	12

4.0 Assessment

Component	Weighting	Minimum Level
Assignment	10%	70%
Class Exercises	N/A	
Laboratory	10%	
Project	20%	
Short Test	30%	
Final Examination	30%	30%

Dates:

(a) Short Test and Other assessment will be as follows:

Assessment	**Date**	**Weighting**
Assignment 1	Week 7	5%
Assignment 2	Week 12	5%
Class Test 1	Week 8	15%
Class Test 2	Week 12	15%
Laboratory (x10)	During the semester	10%
Project 1	Week 6	10%
Project 2	Week 12	10%

(b) In order to pass the course, that is, to obtain a grade of C- or better, it is necessary for students get a minimum attendance of 75% and pass the coursework and score at least 50% (ie. 50/100) in the final examination. It is highly recommended that students attend all tutorials/labs/workshops. The following grading system will be used:

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B	70-74	3.00-3.27
B-	65-69	2.67-2.93

C+	60-64	2.33-2.60
C	55-59	2.00-2.27
C-	50-54	1.67-1.93
D+	45-49	1.33-1.60
D	40-44	1.00-1.27
D-	35-39	0.67-0.93
E	Below 35	0
DNQ	Did Not Qualify	0
W	Withdrawn from Unit	0
CT	Credit Transfer	0
NV	Null & Void for Dishonest Practice	0
I	Results Withheld/Incomplete Assessment	0
X	Continuing course	0
DNC	Did Not Complete	0
CP	Compassionate Pass	0
AEG	Aegrotat Pass	0
PT	Pass Terminating	0
P	Pass	0
NP	Not Passed	0

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3. Paraphrasing or summarizing a source’s words or ideas without proper citation.
4. Including a graph, table or picture from a source without proper citation.
5. Getting so much help from a tutor or writing helper that the paper or part of the paper is no longer honestly your own work.
6. Turning in previously written work when that practice is prohibited by your instructor.