College of Micronesia – FSM
P.O. Box 159
Kolonia, Pohnpei

Course Outline Cover Page

Applied Mechanics I   **ME 221**
   Course Title   Department and Number

Course Description: This course will provide the student with the knowledge and skills required to explain and calculate the basic effects of forces and displacements on machinery and structural components.

Prepared by: Brent Villiers   **State:** FSM-FMI

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	3/6/12/24	16/8/4/2	48	3
Laboratory	3/6/12/24	16/8/4/2	48	1

                                           Total Semester Credits: 4

Purpose of Course

Degree Requirement	_____XX_____
Degree Elective	_____
Advanced Certificate	_____
Certificate	_____
Remedial	_____
Other (Workshop)	_____

Prerequisite Course(s): ME 179 Practical Mathematics

_____   _____
Signature, Chairman, Curriculum Committee   **Date Approved by Committee**

_____   _____
Signature, President, COM-FSM   **Date Approved by the President**

General Objective: On successful completion of this course, the student will be will able to explain and calculate the basic effects of forces and displacements on machinery and structural components.

Learning Outcomes: On successful completion of this course the student will be able to:

1.   Determine the area, volume, and mass of basic shapes.
2.   Investigate the effect of forces on a plane surface
3.   Investigate the kinematics of motion in one plane.
4.   Determine the motion and the power developed of an object under a constant force.
5.   Investigate the kinematics of machines.
6.   Determine the stress and strain in ductile and brittle material.

> ***STUDENTS SHOULD BE MADE AWARE OF OCCUPATIONAL HEALTH AND SAFETY ISSUES IN ALL SITUATIONS AND BE EXPECTED TO DEMONSTRATE SAFE WORKING PRACTICES AT ALL TIMES.***

Outline of Content: This course contains:

1. Area, Volume, and Mass
   - Area of common shapes, including trapeziums
   - Volume and mass
   - Shapes having a uniform cross sectional area
   - Partially filled tanks

2. Statics
   - Pressure
   - Area
   - Vectors
   - Resultants
   - Equilibrium
   - Moments
   - Friction

3. Kinematics
   - Linear motion
   - Displacement
   - Velocity
   - Uniform acceleration
   - Relative velocity

4. Dynamics
- Momentum
- Work and power
- Conservation of energy and momentum
- Potential and kinetic energy
- Newton's laws of motion

5. Machines
- Levers
- Wheels and axels
- Single reduction gear

6. Stress and Strain
- Direct stress and strain
- Shear stress
- Hooke's Law
- Ultimate tensile strength and yield strength
- Proof stress
- Factor of safety
- Working stress and safe working loads
- Stress/strain diagrams
- Ductile and brittle material

Learning Outcomes:	On completion of this course the learner will be able to:
Learning Outcome 1	**Determine the area, volume, and mass of basic shapes.**
Assessment criteria	1.1 Shapes on board vessels related to the basic areas and volumes are identified. 1.2 The area of common shapes, including trapeziums, is calculated. 1.3 The volume and mass of shapes and tanks having a uniform cross sectional area, including trapeziums, are calculated. 1.4 The volume and mass of partially filled tanks are calculated. 1.5 Volumes of shapes built up of regular shapes are calculated.
Conditions and Method of assessment	As specified in the Assessment Strategy listed at the end of this outline and by a combination of: • Written assessment • Calculations

- Assignments
- Oral assessment

Learning Outcome 2	**Investigate the effect of forces on a plane surface.**

Assessment criteria

2.1   The relationship between mass, weight, and gravity is identified.

2.2   The relationship between force, pressure, and area on a plane surface is identified.

2.3   Forces are represented by vectors and solved by force triangles.

2.4   Resultant and equilibrant of a system of concurrent coplanar forces are calculated.

2.5   The moment due to a force is calculated.

2.6   The effects of frictional forces are explained.

Conditions and
Method of assessment

As specified in the Assessment Strategy listed at the end of this outline and by a combination of:
- Written assessment
- Calculations
- Assignments
- Oral assessment
- Practical assessment

Learning Outcome 3	**Investigate the kinematics of motion in one plane.**

Assessment criteria

3.1   The relationships between linear displacement, velocity, and uniform acceleration are explained.

3.2   Displacement, velocity, and acceleration diagrams are produced and relevant problems solved.

3.3   Relative velocities of objects along a given axis are determined.

Conditions and
Method of assessment

As specified in the Assessment Strategy listed at the end of this outline and by a combination of:
- Written assessment
- Calculations
- Assignments
- Oral assessment
- Practical assessment

Learning Outcome 4	**Determine the motion and the power developed of an object under a constant force.**

Assessment criteria

4.1   Newton's Laws of Motion are explained
4.2   The terms momentum, work, and power, including the principles of conservation of momentum, are explained and calculated.
4.3   Motion of objects under a constant force is described and calculated.
4.4   Work done and power developed of objects under uniform linear velocity are calculated.
4.5   The terms potential energy and kinetic energy are defined and the principles of conservation of energy are explained.

Conditions and
Method of assessment

As specified in the Assessment Strategy listed at the end of this outline and by a combination of:

- Written assessment
- Calculations
- Assignments
- Oral assessment
- Practical assessment

Learning Outcome 5	**Investigate the kinematics of machines.**

Assessment criteria

5.1   Velocity ratio, mechanical advantage, and efficiency of simple machines are defined.
5.2   The basic operation and advantage of simple levers, wheels and axles, and single reduction gears are explained
5.3   The velocity ratios, mechanical advantage, and efficiency of wheels and axles, and simple levers are calculated.
5.4   Gear ratios of single reduction gears are calculated.

Conditions and
Method of assessment

As specified in the Assessment Strategy listed at the end of this outline and by a combination of:

- Written assessment
- Calculations
- Assignments
- Oral assessment
- Practical assessment

| **Learning Outcome 6** | **Determine the stress and strain in ductile and brittle material** |

Assessment criteria

6.1 Direct stress and strain are calculated.
6.2 Hooke's Law and modulus of elasticity are explained.
6.3 The terms ultimate tensile strength, yield stress, proof stress, working stress, and factor of safety are explained.
6.4 Safe working loads are calculated.
6.5 Shear stress is explained.
6.6 The behavior of ductile and brittle material under varying loads are sketched and explained.

Conditions and
Method of assessment

As specified in the Assessment Strategy listed at the end of this outline and by a combination of:
- Written assessment
- Calculations
- Assignments
- Oral assessment
- Practical assessment

Delivery strategy

The module provides for delivery by on and off-the-job training and assessment.

Some areas of content may be common to more than one learning outcome, and therefore integration of training and assessment may be appropriate.

Methods of instruction includes:
1. Classroom lectures with handouts, course notes, overhead transparencies (or equivalent), slide presentations, video material, and whiteboard notes;
2. Calculation via examples and tutorials; and
3. Practical demonstrations.

Resource requirements

Delivery of the training will require:
- Classroom
- Whiteboard
- Overhead projector (or equivalent)
- Access to appropriate vessels or models.
- Video player
- Extension meter (or equivalent)

Assessment Strategy

Assessment Method	Knowledge based criteria will be satisfied through a combination of calculations, written and oral assessments. Skill based criteria will be satisfied through practical exercises.
Condition of Assessment	This module may be assessed on and off-the-job. Competence may be assessed in the following situations: classroom; laboratories; and appropriate vessels.

Evaluation:

Final Grade for this course will be based on meeting the course requirements at the following percentage rates:

96% - 100%	A – Superior
90% - 95%	B – Above Average
80% - 89%	C – Average
69% - 79%	D – Below Average
0 % - 69%	F – Failure

Attendance:

The COM-FSM attendance policy will apply.