EN 449

Applied Mechanics

5 Credits

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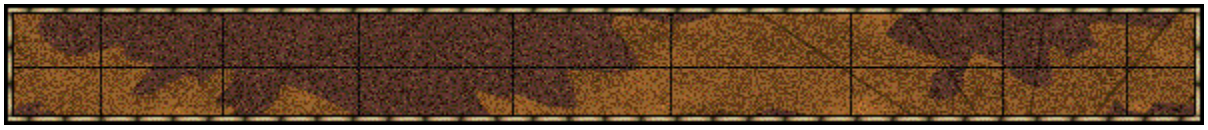

Applied Mechanics

Calendar Description

This course is an in depth study of applied engineering mechanics. Topics include statics and dynamics, energy & power and fluid mechanics.

Rationale

This course has been developed to fill the gap of Second Class Power Engineers created by the retiring generation of power engineers.

Industry has shifted their focus from employing the lower levels of certification of power engineers to the higher levels of certification.

Upon successful completion of this program the student is eligible for a 9 month reduction in qualifying time experience granted by ABSA.

The six parts of the program are divided into 15 courses where the student has the option of registering for individual courses, Part A, Part B, or both Part A and Part B.

Prerequisites

EN 310, EN 320, EN 410, EN 420, or Third Class Power Engineer's Certificate of Competency.

Co-Requisites

None

Course Learning Outcomes

Upon successful completion of this course, students will be able to

1. solve engineering problems by applying the principles of ratio and proportion, algebraic equations, quadratic equations, powers, roots, logarithms, trigonometry, and geometry.
2. calculate the displacement, velocity, and acceleration of bodies moving in a straight line.
3. describe the relationship between mass, force, acceleration and weight.
4. explain "inertia" and "momentum".

5. demonstrate graphically the relationship between work, force, and distance.
6. define and calculate the kinetic energy of moving objects.
7. define and calculate the potential energy of stationary objects.
8. explain the Law of Conservation of Energy.
9. define and calculate indicated power.
10. define and calculate angular displacement, angular velocity, and angular acceleration.
11. define and calculate moment of inertia, radius of gyration and torque.
12. define and calculate the kinetic energy of rotating masses.
13. define work and power. Calculate brake power and mechanical efficiency of a reciprocating engine.
14. calculate the power transmitted by a belt drive.
15. define centrifugal and centripetal force, centripetal acceleration and perform calculations involving them.
16. calculate the distance of movement of a governor due to centrifugal force.
17. calculate how to balance a rotating mass.
18. describe the concept, types and laws of friction.
19. define and calculate the coefficient of friction and applied forces for objects moved on a horizontal surface by forces parallel to the inclined plane.
20. define and calculate the applied forces for objects moved on a horizontal surface by forces not parallel to the incline plane.
21. define and calculate the applied forces for objects moved on an incline plane.
22. define and calculate the frictional forces on a screw jack.
23. define and calculate maximum torque on a belt drive.
24. define and evaluate forces in terms of moments and couples.
25. define and calculate centroids and first and second moments of areas.
26. define and calculate the different types of stress.
27. define strain, modulus of elasticity, Poisson's ratio and perform calculations.
28. describe the thermal expansion of bars, including reactions, under conditions of restricted expansion and reactions of bars composed of dissimilar metals.
29. define and calculate shear forces and bending moments for simply supported beams and cantilevers.
30. perform calculations involving the fundamental torsion equation and explain the relationship between torque and stress.
31. explain the relationship between torque and power, and calculate maximum and mean torque for solid shafts of circular cross section.
32. calculate stress in coupling bolts due to torque.
33. describe the basics of fluid mechanics.
34. perform calculations related to pressure in a fluid.
35. define and calculate thermal expansion of a vessel and its liquid contents.
36. define and calculate thermal expansion of a vessel and its liquid contents.
37. describe flow in open channels and calculate fluid flow through a weir.
38. describe liquid flow in a pipe using the continuity equation.
39. apply the law of conservation of energy to fluid flow and define Bernoulli's equation.
40. calculate fluid flow from a vessel orifice.
41. calculate flow using a venturi meter.

Resource Materials

Required Text:

Power Engineering Second Class Part A-1 Mechanics, Edition 2.5 (Also acceptable is ed. 2.0)

Calgary, AB: PanGlobal Training Systems Ltd. *Reed's Applied Mechanics*, Vol. 2, ed. 6

(Also acceptable is ed. 5)

2010 ASME Extract and Supplement.

Conduct of Course

This course follows the syllabus as set out by the Standardization of Power Engineer's Examination Committee (SOPEEC) and the curriculum recommended by the Interprovincial Power Engineer Curriculum Committee (IPECC).

This course builds on the student knowledge gained through the Fourth Class and Third Class courses.

This course is delivered face to face and includes class lectures, group discussions, demonstrations, assignments and projects.

Cutaway models and actual equipment may be used to support instruction and demonstrations.

Where applicable video clips may be used to support instruction and demonstrations.

D2L is used as a support educational resource.

Evaluation Procedures

Lakeland College is committed to the highest academic standards. Students are expected to be familiar with Lakeland College policies related to academic conduct and academic honesty and to abide by these policies.

The marking scheme for this course is:

	MATH	MECHANICS	TOTAL
Assignments	3%	25%	28%
Unit Tests	7%	35%	42%
Final Exam		30%	30%
Total	10%	90%	100%

The contents and dates of the chapter exams are determined in class.

All questions are long answer written types of questions.

A minimum grade of 65% is required to pass this course.

The final exam for this course will be part of a combined 2A1 Final Exam for the semester.

A GRADE OF AT LEAST 50% IS REQUIRED ON THE FINAL EXAM TO PASS THIS COURSE.

Those students seeking a qualifying time reduction must achieve a grade of 65% for sections A-1, A-2. A-3. B-1, B-2, B-3.

Students receive a certificate from Lakeland College indicating successful completion of the program.

NOTE:

This program consists of six components; each component corresponds to one examination paper of the Alberta Boilers Association (ABSA) examination process.

The requirements for a second class power engineer consist of six ABSA examinations and 30 months of qualifying industry experience

Grade Equivalents and Course Pass Requirements

A minimum grade of C+ (65%) is required to pass this course.

Letter	F	C+	B-	B	B+	A-	A	A+
Percent Range	0-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Points	0.00	2.30	2.70	3.00	3.30	3.70	4.00	4.00

Attendance

For those students seeking the nine month experience qualifying time reduction granted by ABSA refer to the Student Handbook (80% attendance of the total two semesters).

For the remaining students there is no mandatory attendance requirement.

Course Units/Topics

Linear and Projectile Motion

Angular Motion

Relative Motion

Friction

Static and dynamic Forces

Inertial and Momentum

Work, Power and Energy

Centripetal Forces

Moments of Forces and Area

Stress and Strain

Shear Forces and Bending Moments

Torsion

Fluid Mechanics

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