

ME 549 – WAVE PROPAGATION, IMPACT AND EXPLOSIONS – Fall 2013

Room EGR 222 – MWF 11:00 – 11:50 am

Instructor: Serge Abrate, Professor, Room B112, abrate@engr.siu.edu

Office hours: MWF 9:00-11:00 am, W 1:00-3:00 pm

Textbook: No book. Notes will be provided.

Objectives: This class will introduce basic concepts related to transient dynamic loading resulting from impacts and explosions and the propagation of disturbances in solids and fluids. Students are expected to master these concepts and learn how to apply them to solve practical problems.

Attendance is mandatory. Missed quizzes cannot be made up and will result in a grade of zero.

Quizzes: Quizzes will be given once a week on average.

Homework: a set of homework problems will be given every week. These assignments should be turned in on the due date at the beginning of class. No late homework will be accepted.

Tests: Test 1: Friday, September 20, 2013. Test 2: Friday, October 25, 2013. Test 3: Tuesday, December 10, 2013, 12:50-2:50 am. Attendance is mandatory. Absences will be excused only in very rare cases.

Final grade: Test: 60%, HWK: 20 %, Quizzes: 20%

CONTENTS

1- ELASTICITY

Stress, strain, stress-strain relations, equations of motion, exact solutions, beam theories

2- WAVE PROPAGATION

Axial motion of a rod and related problems, D'Alembert's solution, impact problems, application to material testing, body waves in solids, surface waves, wave propagation in beams and plates. Waves in fluids.

3- IMPACT

Rigid body impact, car crashes, impacts on water, low velocity impacts, ballistic impacts

5- EXPLOSIONS

Underwater explosions, explosions in air