2014 Spring Semester — Course Syllabus

| Lecture | | Mon 3:30-6:15pm | VHE210 |
|---|---------------|---|--------|
| Professor | Vincer | nt W Lee | |
| Office | KAP23 | 30B | |
| Phone | 213-74 | 400568 | |
| Email | vlee@ | usc.edu | |
| Office Hours | MWF | 10:00-11:00am or other time by arrangement | |
| Teaching Assistant | | | |
| Office | | | |
| Phone | | | |
| Email | | | |
| Office Hours | | | |
| Prerequisites | | | |
| Textbook(s) | Wave Lectu | Propagation in elastic Solids J.D. Achenbach N. Holland Publishing Co re Notes to be Posted | |
| References | | | |
| Course Description | | | |
| Course Objectives | | | |
| Learning Objectives | | | |
| Policies on: | | | |
| Late work | | | |
| Make-up work | | | |
| Incomplete work | | | |
| Extra credit | | | |
| Final grade schema is based on the following percentages of graded coursework : | | | |
| Homework | 20 | % | |
| Midterms | 45 | % | |
| Final/Project | 35 | % | |
| Total | 100 | % | |

2014 Spring Semester — Course Syllabus

Class Schedule

| Week | Date | Topics | Posted Notes | |
|------|----------------|---|-----------------|--|
| 1 | Jan 13-17 | Introduction – The Wave Equation; D'Alembert Chap 1 | | |
| 2 | Jan 20-24 | Jan20-M.L.King Holiday; Equation of motions in terms of displacements Helmholtz Decomposition | Chap 1 | |
| 3 | Jan 27-31 | P, SV, SH Waves: Incidence on Half-Space | Chap 2 | |
| 4 | Feb 3-7 | P, SV, SH Waves (cont.): Stress-Free Boundary Conditions | Chap 2 | |
| 5 | Feb 10-14 | Love Surface Waves; Rayleigh Surface Waves; Layered Half-Space | Chap 2 | |
| 6 | Feb 17-21 | Feb17-President's Day; Cylindrical Coord. & Waves | Chap 3 | |
| 7 | Feb 24-28 | Bessel Equations; Circular Inclusions in Full-Space | Chap 3 | |
| 8 | Mar 3-7 | Circular Inclusion in Half-Space: Surface Inclusions - Canyons. Valleys & Foundations | Chap 4 | |
| 9 | Mar 10-14 | Circular Inclusion in Half-Space: subsurface Inclusions - Cavities , Pipes & Tunnels | Chap 4 | |
| 10 | Mar 17-21 | Spring Recess | | |
| 11 | Mar 24-28 | Wedge Shape in Half-Space – Quarter Space | Chap 5 | |
| 12 | Mar31- Apr4 | Waves in Wedge Space | Chap 5 | |
| 13 | Apr 7-11 | Arbitrary-Shaped Inclusions; P-waves on Underground Cavity & surface Canyons | Chap 6 | |
| 14 | Apr 14-18 | Waves on Semi-Circular Hills | Chap 6 | |
| 15 | Apr 21-25 | 3D waves in spherical Coordinates | Chap 6 | |
| 16 | Apr28 -May2 | Elliptic Canyons, Valleys & Hills | Invited Lecture | |
| | | | | |
| | | HW, MTs, Final & Projects to be arranged | | |
| | | | | |
| | | | | |

2014 Spring Semester — Course Syllabus

Table of Contents

| 1.0) | Intro | duction | |
|------|---------|--|------------|
| ŕ | 1.1-1,2 | 1-D Wave Equation; Separation of Variables | 1-1 to 1-2 |
| | 1.3 | D'Alembert Solution | 1-4 |
| | 1.4 | Equations of Motion in Terms of Stresses | 1-7 |
| | 1.5 | Stress-Strain Displacement Relations | 1-10 |
| | 1.6 | Equation of motion in terms of displacements | 1-12 |
| | 1.7 | Solution of Equation of Motion: Helmholtz Decomposition | 1-14 |
| 2.0) | P, SV | / & SH Waves | |
| | 2.1 | Half-spaced Problem with Stress Boundary Condition | 2-2 |
| | 2.2 | P, SV, SH Waves | 2-6 |
| | 2.3-2.5 | Incident of Plane SH, P & SV Waves | 2-8 to 19 |
| | 2.6 | SH Waves in Two Semi-Infinite Media in Contact | 2-30 |
| | 2.7 | Surface SH Waves in 1-Layer Half-Space - Love Waves | 2-32 |
| | 2.8 | P, SV Waves in Two Semi-Infinite Media in Contact | 2-36 |
| | 2.9 | Incident P, SV Wave in 1-Layered Half-Space | 2-39 |
| | 2.10 | Non-Viscous Ideal Fluid-Solid Interface | 2-42 |
| 3.0) | Cylir | ndrical Coordinates & Circular Inclusions | |
| | Cylind | Irical Coordinate Systems | 3-1 |
| | Besse | l Equations | 3-3 |
| | Circul | ar Inclusions in Full-Space | 3-5 |
| | Far Fi | eld P and SV Waves | 3-13 |
| | Near I | Field SH Source | 3-20 |
| | Nume | rical Implementations | 3-22 |
| 4.0) | Circ | ular Inclusion in Half-Space | |
| | Inclus | ion Symmetric about X-Axis | 4-1 |
| | Secon | d Medium | 4-3 |
| | Canyo | ons. Valleys & Foundations | 4-4 |
| | Caviti | es, Pipes & Tunnels | 4-6 |
| 5.0) | Wed | ge Shape in Half-Space | |
| | Specia | al Case (Quarter Space) | 5-1 |
| | Wave | s in Wedge Space | 5-3 |
| | MacD | onald (1902): Using Green's Function Solution | 5-5 |
| 6.0) | Othe | r Topics | |
| | Arbita | ry Shape Inclusion | 6-1 |
| | Incide | nt P-Wave on Underground Cavity | 6-8 |
| | Incide | nt of Plane SH-Waves on a Semi-circular Hill & with Tunnel | 6-20 |
| | Lamb | 's Problem; PoroElastic Media | 6-32 |
| | Ellipti | c Canyon, Valleys & Hills | |

2014 Spring Semester — Course Syllabus

STATEMENT ON ACADEMIC INTEGRITY

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own.

All students are expected to understand and abide by these principles. *SCampus,* the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A:

http://www.usc.edu/dept/publications/SCAMPUS/gov/

Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at:

http://www.usc.edu/student-affairs/SJACS/

STATEMENT FOR STUDENTS WITH DISABILITIES

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible.

DSP Contact Information

| Location: | STU 301 |
|---------------|--|
| Hours open: | 8:30 a.m. until 5:00 p.m., Monday — Friday |
| Phone number: | (213) 740-0776 |