

# 대학원 강의 계획서

2018년 2학기

기계공학과

|               |                                                                                                            |                                                                                                                                               |                              |      |
|---------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------|
| 교 과 목         | <b>탄성파이론</b> (2160456901)                                                                                  |                                                                                                                                               | 학 점                          | 3    |
| 담당교수          | 김 진 오                                                                                                      | 전 화                                                                                                                                           | 02-820-0662<br>010-8985-0662 |      |
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| 교과목 개요 및 목표   | 탄성체에서의 역학적 파동을 대상으로, 매질 내부에서 파동의 전파와 매질 경계면에서 파동의 반사/투과/굴절 등을 이론적으로 다룸.<br>초음파 센서/액추에이터 기술 응용의 이론적 기반을 갖추. |                                                                                                                                               |                              |      |
| 수업진행방법        | 강의 및 토의                                                                                                    |                                                                                                                                               |                              |      |
| 평가방법          | 시험(50점 = 25점×2회), 과제(40점, 10회), 출석(10점: 시간당 결석 -1점, 지각/외출/조퇴 -0.3점)                                        |                                                                                                                                               |                              |      |
| 교<br>재        | 주교재                                                                                                        | J. D. Achenbach, Wave Propagation in Elastic Solids, North-Holland, 1975.                                                                     |                              |      |
|               | 강의노트                                                                                                       | <a href="http://jokim.kr">http://jokim.kr</a> → 강의과목 → 탄성파이론 → 예습자료                                                                           |                              |      |
|               | 참고자료                                                                                                       | J. L. Rose, Ultrasonic Waves in Solid Media, Cambridge University Press, 1999.                                                                |                              |      |
| <b>강좌의 개요</b> |                                                                                                            |                                                                                                                                               |                              |      |
| 주             | 강의 내용                                                                                                      | 세부 내용                                                                                                                                         |                              | 일정   |
| 1             | 0. Introduction                                                                                            | concepts<br>applications<br>elasticity                                                                                                        |                              | 9.6  |
| 2             | 1. One-Dimensional Motion of an Elastic Continuum (1)                                                      | 1.2.8 waves in one-dimensional longitudinal strain<br>1.2.7 solution of the wave equation<br>1.5 waves in one-dimensional longitudinal stress |                              | 9.13 |
| 3             | 1. One-Dimensional Motion of an Elastic Continuum (2)                                                      | 1.A transverse waves in an infinite space<br>1.3 half-space subjected to uniform surface traction<br>1.4a reflection                          |                              | 9.20 |
| 4             | 1. One-Dimensional Motion of an Elastic Continuum (3)                                                      | 1.4b reflection and transmission<br>1.6 harmonic waves<br>1.B at a sudden change of cross-section                                             |                              | 9.27 |

| 주  | 강의 내용                                              | 세부 내용                                                                                                                                                                                                         | 일정            |
|----|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 5  | 2. General Dynamic Elasticity (1)                  | 2.2 notation & mathematical preliminaries<br>2.3 kinematics and dynamics<br>2.4 homogeneous, isotropic, linearly elastic solid<br>2.5 problem statement in dynamic elasticity<br>2.6 one-dimensional problems | 10.4          |
| 6  | 2. General Dynamic Elasticity (2)                  | 2.7 two-dimensional problems<br>2.10 displacement potentials<br>2.11 equations in rectangular coordinates<br>2.13 equations in cylindrical coordinates<br>2.14 equations in spherical coordinates             | 10.11         |
| 7  | 4. Elastic Waves in an Unbounded Medium (1)        | 2.15 ideal fluid<br>4.1 plane waves<br>4.2 time-harmonic plane waves                                                                                                                                          | 10.18         |
| 8  | Midterm Exam.                                      | Chapters 1, 2                                                                                                                                                                                                 | 10.25         |
| 9  | 4. Elastic Waves in an Unbounded Medium (2)        | 4.3 wave motions with polar symmetry<br>4.4 two-dimensional wave motion in axial symmetry<br>4.5 propagation of wavefronts                                                                                    | 10.25<br>(보강) |
| 10 | 5. Plane Harmonic Waves in Elastic Half-Spaces (1) | 5.1 reflection and refraction at a plane interface<br>5.2 plane harmonic waves<br>5.4 joined half-spaces<br>5.5 reflection of SH-waves                                                                        | 11.1          |
| 11 | 5. Plane Harmonic Waves in Elastic Half-Spaces (2) | 5.9 reflection and refraction of SH-waves<br>5.6 reflection of P-waves                                                                                                                                        | 11.8          |
| 12 | 5. Plane Harmonic Waves in Elastic Half-Spaces (3) | 5.10 reflection and refraction of P-waves<br>5.7 reflection of SV-waves                                                                                                                                       | 11.15         |
| 13 | 5. Plane Harmonic Waves in Elastic Half-Spaces (4) | 5.A reflection and refraction of SV-waves<br>5.11 Rayleigh surface waves<br>5.12 Stoneley waves<br>5.B Scholte waves and leaky Rayleigh waves                                                                 | 11.22         |
| 14 | 6. Harmonic Waves in Waveguides (1)                | 6.1 introduction<br>6.5 group velocity<br>6.6 Love waves<br>6.7 Lamb waves<br>6.8 Rayleigh-Lamb frequency spectrum                                                                                            | 11.29         |
| 15 | 6. Harmonic Waves in Waveguides (2)                | 6.9 waves in a rod of circular cross-section<br>6.10 waves in a circular rod of solid cross-section<br>6.11 approximate theories for rods                                                                     | 12.6          |
|    | (복습)                                               |                                                                                                                                                                                                               | 12.13         |
| 16 | Final Exam.                                        | Chapters 4, 5, 6                                                                                                                                                                                              | 12.20         |