Basic mathematics

- Generalized functions (delta function, step function)
- Linear systems (impulse response, system function)
- Integral transforms (Fourier, Hankel)
- Contour integration
- Integrals with rapidly varying integrands (stationary phase)
- Nyquist sampling theorem

Wave equations

- Acoustic field from a point source
- Acoustic field in a viscous fluid (Stokes’ equation)
- Complex sound speed
- Dispersion and attenuation
- Causality and Kramers-Kronig dispersion relations

Ideal waveguide

- Normal modes
- Plane wave representation of the field
- Wave solution (using integral transforms)

Reflection from a fluid-fluid boundary

- Rayleigh reflection coefficient
- Weston’s “effective depth” approximation

Pekeris waveguide

- “Effective depth” representation
- Normal modes
Solution for modal field

Ambient noise

- Plane wave noise fields
- Spatial coherence (isotropic noise)
- Spatial coherence (symmetrical and anti-symmetrical noise fields)
- Spatial coherence from vertical directionality
- Green’s function from ambient noise

Acoustic arrays

- Directivity index
- Array gain
- Noise gain

Wave propagation in marine sediments

- Experimental data (compressional and shear waves)
- Biot theory
- Grain-Shearing theory

Moving sources

- Doppler frequency shifts
- Field from a moving source