

NDT Course Syllabus

Ultrasonic Testing Level I:

1- Sound Wave

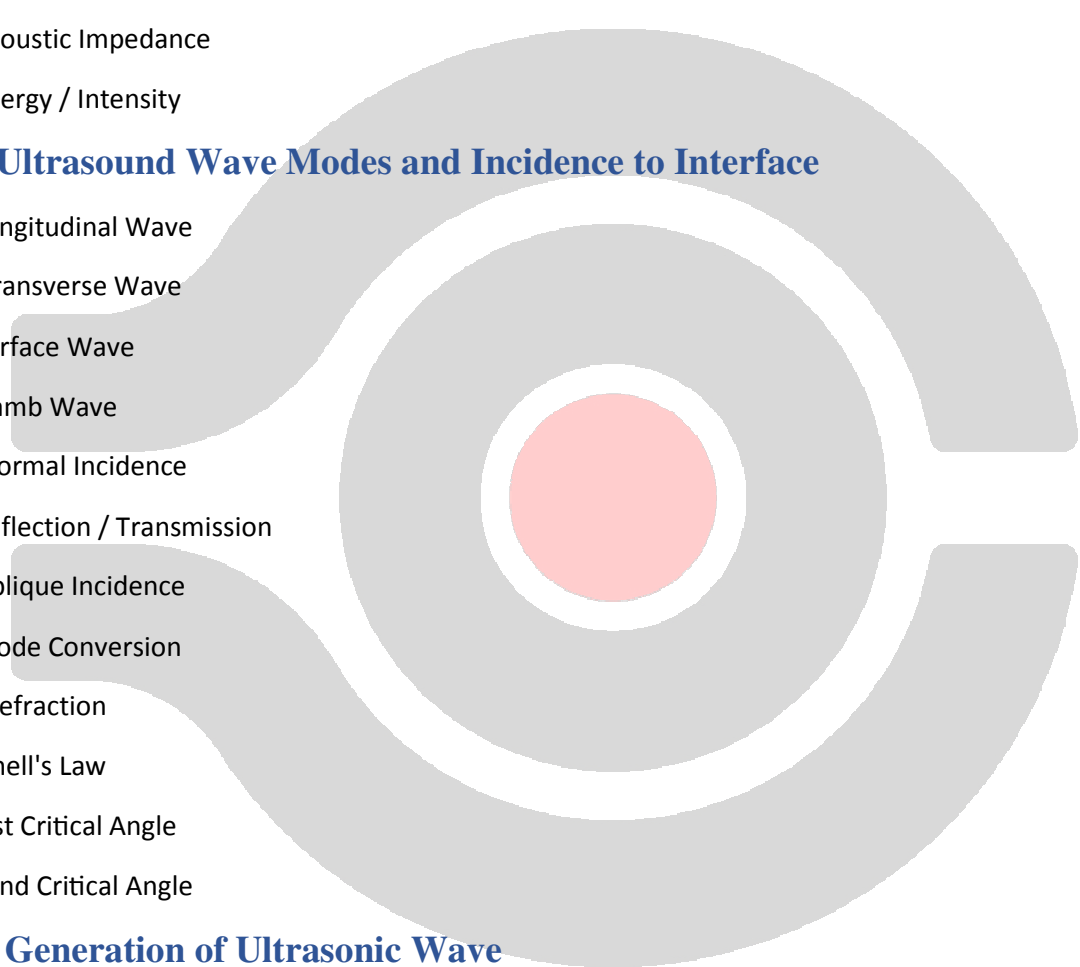
- Introduction
- ASNT Level I
- Sound Wave Propagation
- Velocity / Frequency / Wave Length
- Acoustic Impedance
- Energy / Intensity

2- Ultrasound Wave Modes and Incidence to Interface

- Longitudinal Wave
- Transverse Wave
- Surface Wave
- Lamb Wave
- Normal Incidence
- Reflection / Transmission
- Oblique Incidence
- Mode Conversion
- Refraction
- Snell's Law
- 1 st Critical Angle
- 2 nd Critical Angle

3- Generation of Ultrasonic Wave

- Piezoelectric Effect
- Ultrasonic Transducer
 - Natural Piezoelectric Transducers
 - Polarized Ceramic Transducers
- Ultrasonic Beam
 - Near Field
 - Far Field



NDT Course Syllabus

- Beam Divergence

4- Attenuation

- Scattering Effect
- Absorption Effect
- Divergence Effect
- Surface Roughness and Coupling Effect
- Graininess

5- Basic Ultrasonic Test Methods

- Through Transmission
- Pulse Echo

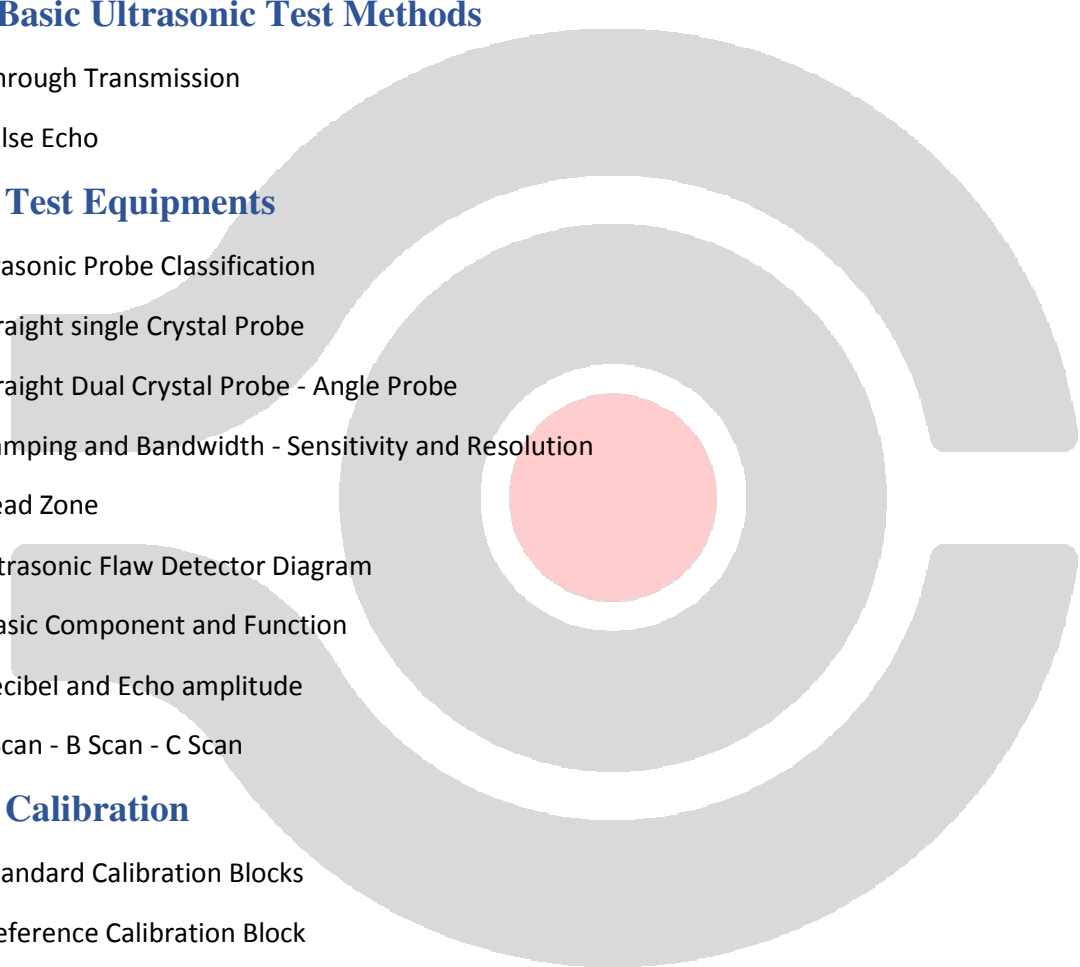
6- Test Equipments

Ultrasonic Probe Classification

- Straight single Crystal Probe
- Straight Dual Crystal Probe - Angle Probe
- Damping and Bandwidth - Sensitivity and Resolution
- Dead Zone
- Ultrasonic Flaw Detector Diagram
- Basic Component and Function
- Decibel and Echo amplitude
- A Scan - B Scan - C Scan

7- Calibration

- Standard Calibration Blocks
- Reference Calibration Block
- Linearity Check
- Time Base Calibration
- Sensitivity Calibration and DAC
- Determination of Probe Index Point
- Checking of Probe Angle
- Resolution of Normal Probe
- Penetration Power of Normal probe



NDT Course Syllabus

- Determination of Dead Zone for Normal Probe

8- Geometric Rules

- Full Skip Distance
- Beam Path
- Determination of Reflector Location

9- Techniques

- Contact Technique
- Coupling Media
- Immersion Technique

10- Defect Sizing

- 6dB Drop Method
- 20dB Drop Method

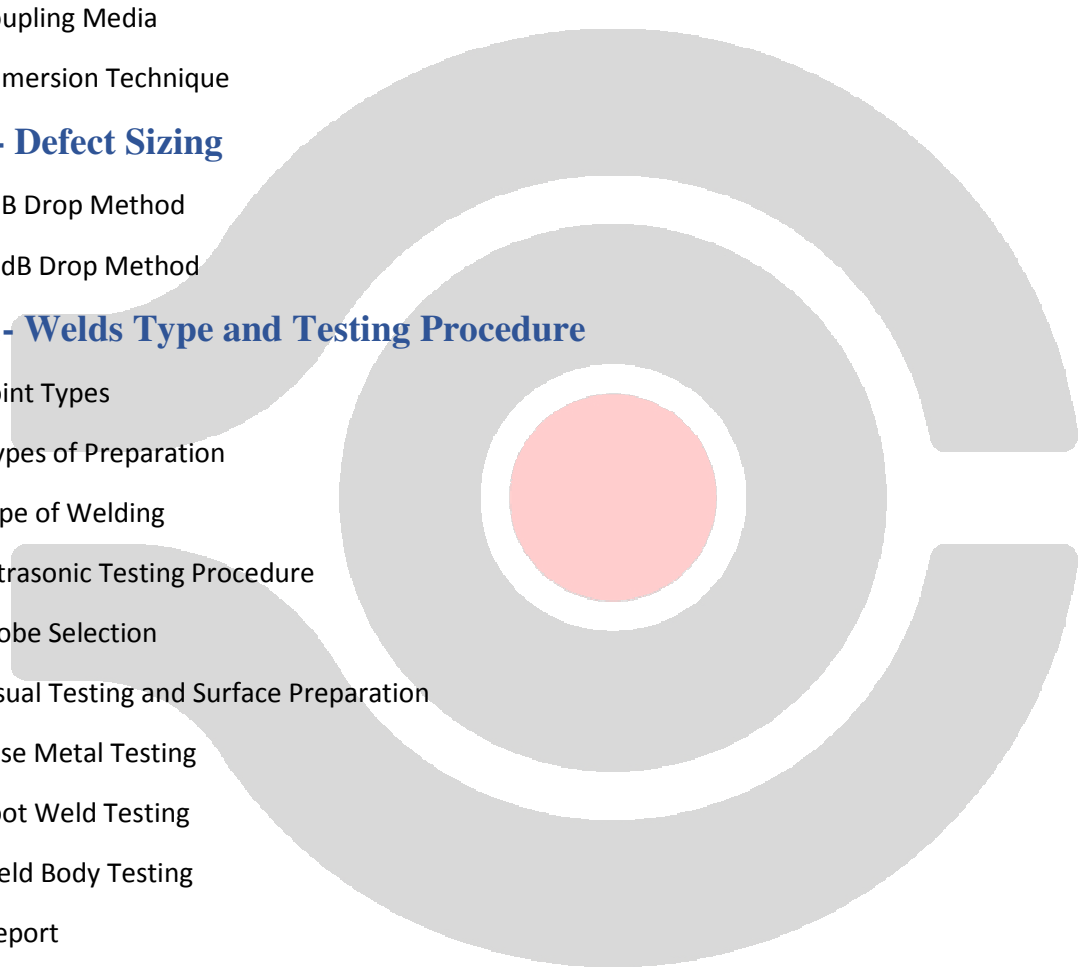
11- Welds Type and Testing Procedure

- Joint Types
- Types of Preparation
- Type of Welding
- Ultrasonic Testing Procedure
- Probe Selection
- Visual Testing and Surface Preparation
- Base Metal Testing
- Root Weld Testing
- Weld Body Testing
- Report

12- Weld Defects and Indications

- Non Relevant Indications
- Relevant Indications
- Welding Defects
- Determination of Defect Nature

13- Standards



NDT Course Syllabus

Ultrasonic Testing Level II:

1- Introduction

- ASNT Level I/II/III
- Scope and Applications

2- Sound Wave Principles and Terms

- Sound and Ultrasound - Sound Wave Diagram
- Velocity / Frequency / Wave Length
- Acoustic Impedance
- Wave Energy / Intensity / Pressure

3- Ultrasound Wave Modes

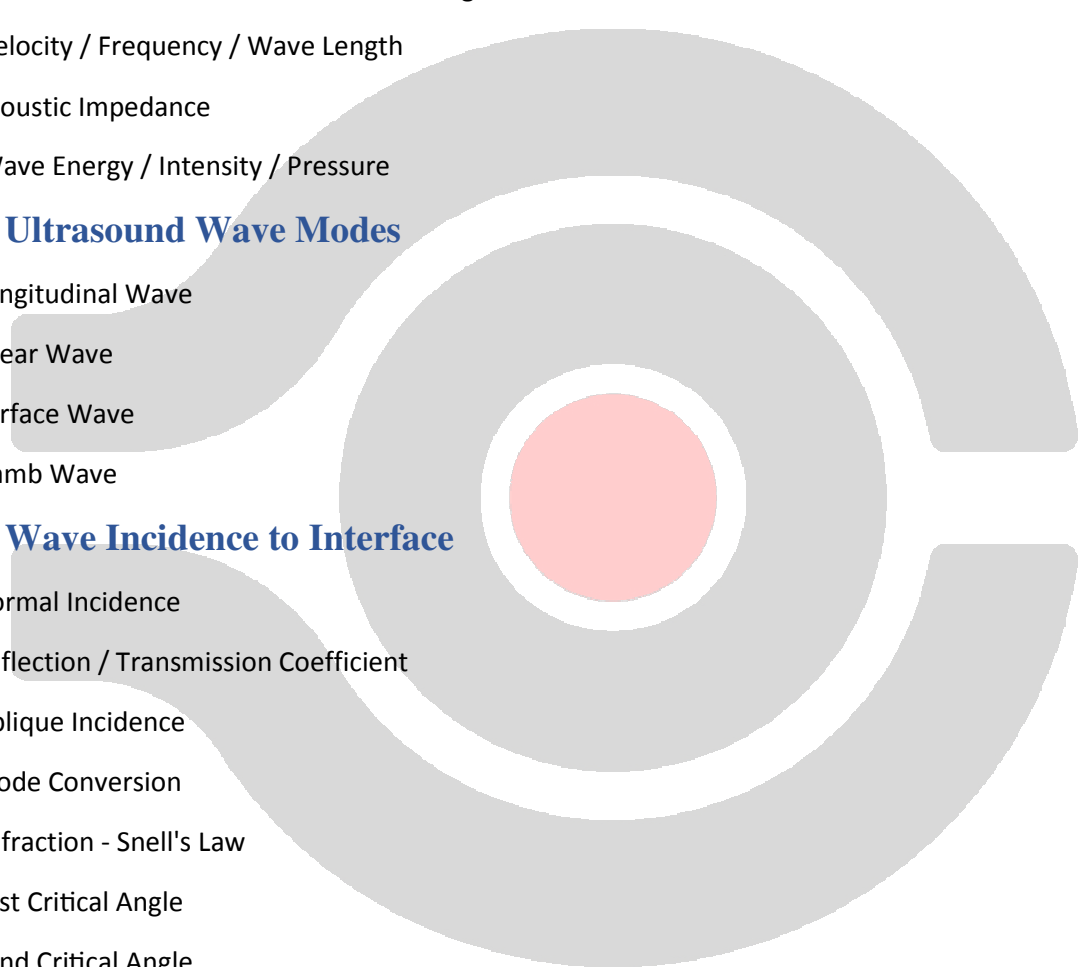
- Longitudinal Wave
- Shear Wave
- Surface Wave
- Lamb Wave

4- Wave Incidence to Interface

- Normal Incidence
- Reflection / Transmission Coefficient
- Oblique Incidence
- Mode Conversion
- Refraction - Snell's Law
- 1 st Critical Angle
- 2 nd Critical Angle

5- Generation of Ultrasonic Wave

- Piezoelectric Effect
- Type of Ultrasonic Transducer
- Type of Piezoelectric Transducer
- Natural piezoelectric Crystal
- Polarized Ceramic Transducer
- Advantages / Disadvantages



NDT Course Syllabus

6- Ultrasound Beam

- Huygens Principle
- Near Field and Characteristics
- Far Field and Characteristics
- Beam Divergence
- Divergence Coefficient

7- Attenuation

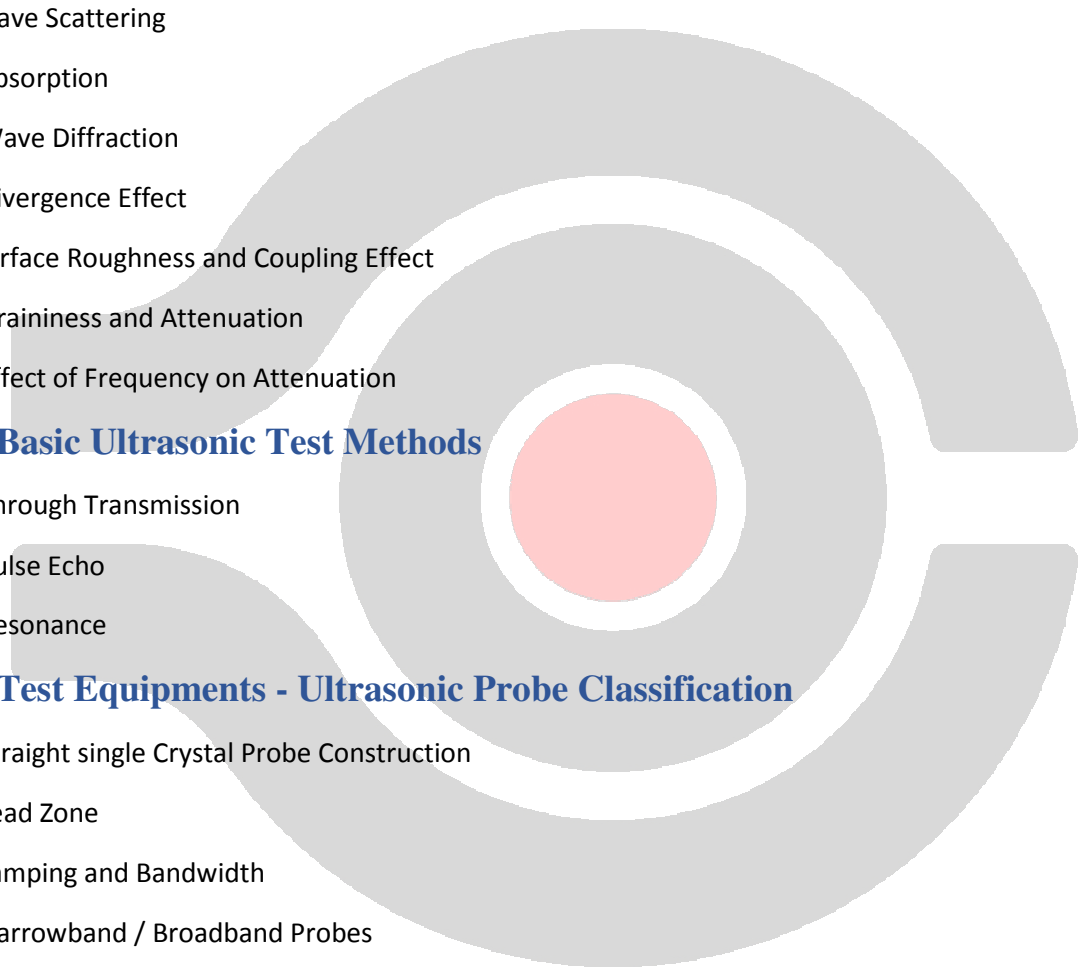
- Wave Scattering
- Absorption
- Wave Diffraction
- Divergence Effect
- Surface Roughness and Coupling Effect
- Graininess and Attenuation
- Effect of Frequency on Attenuation

8- Basic Ultrasonic Test Methods

- Through Transmission
- Pulse Echo
- Resonance

9- Test Equipments - Ultrasonic Probe Classification

- Straight single Crystal Probe Construction
- Dead Zone
- Damping and Bandwidth
- Narrowband / Broadband Probes
- Pulse Length
- Straight Dual Crystal Probe
- Roof Angle
- Angle Probe
- Determination of Wave Angle
- Ultrasonic Flaw Detector Diagram
- Basic Component and Function



NDT Course Syllabus

- CRT - Transmitter /Receiver
- Timer and PRF - Amplifier / Logarithmic Db
- A Scan - B Scan - C Scan

10- Calibration

- Standard Calibration Blocks
- Reference Calibration Block / Artificial Defect
- Vertical and Amplitude Control Linearity Check - Time Base Calibration
- Sensitivity Calibration and DAC
- Determination of Probe Index Point
- Checking of Probe Angle
- Resolution of Normal Probe
- Penetration Power of Normal probe
- Determination of Dead Zone for Normal Probe
- ASME Reference Block
- ASTM Area and Distance Amplitude Blocks

11- Geometric Rules

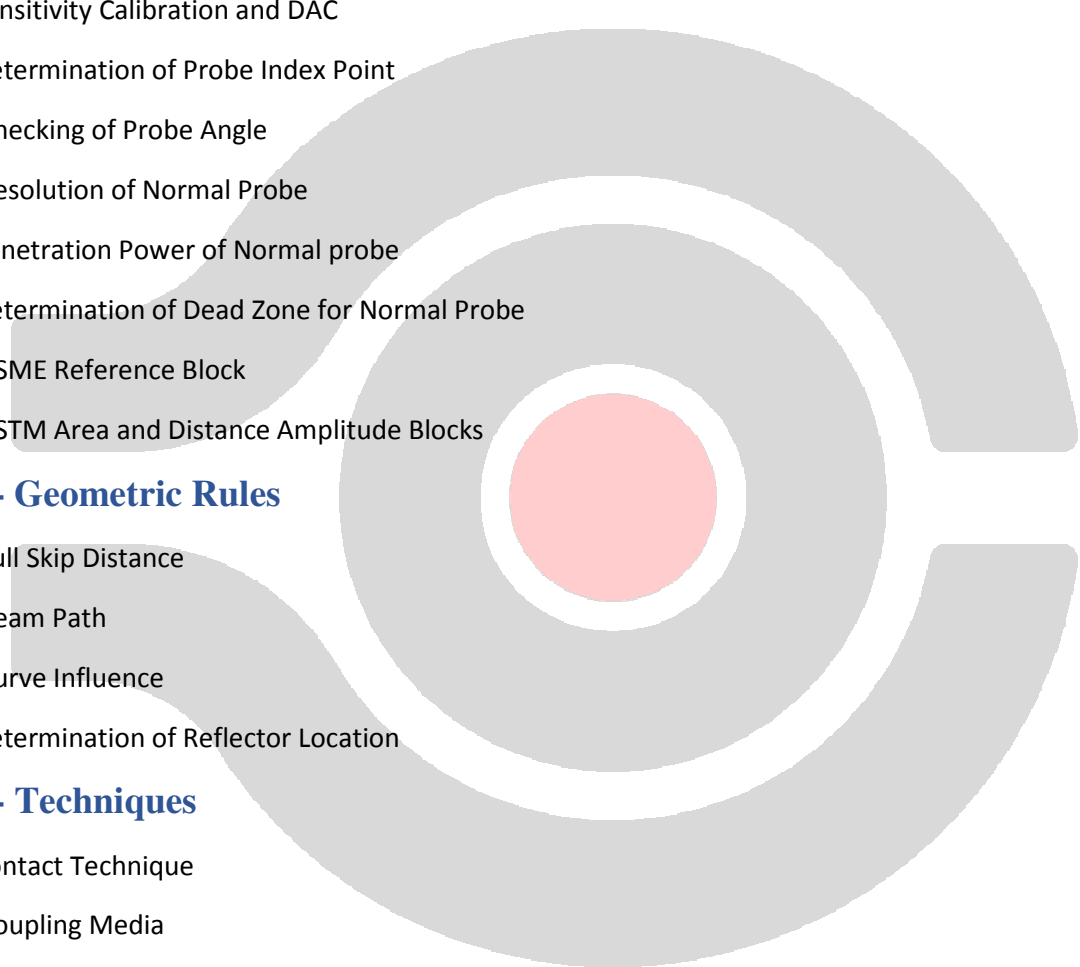
- Full Skip Distance
- Beam Path
- Curve Influence
- Determination of Reflector Location

12- Techniques

- Contact Technique
- Coupling Media
- Immersion Technique
- Bubbler and Wheel Type
- Type of Probe Arrangements

13- Defect Sizing

- 6dB Drop Method
- 20dB Drop Method
- DGS Method



NDT Course Syllabus

14- Welds Type and Testing Procedure

- Standard and Acceptance
- Joint Types
- Types of Preparation
- Type of Welding
- Ultrasonic Testing Procedure
- Probe Selection
- Visual Testing and Surface Preparation
- Base Metal Testing
- Root Weld Testing
- Weld Body Testing
- Report

15- Weld Defects and Interpretation and Evaluation

- Non Relevant Indications
- Relevant Indications
- Welding Defects
- Determination of Defect Nature

16- Standards

References:

- IAEA Ultrasonic Testing of Material-1999
- ASNT Ultrasonic Method-1979
- ASM Vol. 17 – 2004
- ASNT Level III Study Guide

