Chapter 11. Phase Transformations
Bainite

Microstructure of (a + C) formed isothermally below the “knee” of the I-T curve
Spheroidite

A two phase microstructure of spherelike carbides in a ferrite matrix
Martensite

A phase arising from a diffusionless, shearlike phase transformation. In steels containing >0.15 w/o carbon, martensite is a hard, brittle, bct phase that is supersaturated with carbon.
Alloy steel
Ex 11.2)

(a) Rapidly cool to 350°C, hold for $10^4$ s and quench to rt.
(b) Rapidly cool to 250°C, hold for 100 s and quench to rt.
(c) Rapidly cool to 650°C, hold for 20 s, rapidly cool to 400°C, hold for $10^3$ s and quench to rt.
11.6 Continuous cooling transformation diagrams
11.7 Mechanical behavior of iron-carbon alloys
11.8 Tempered Matensite

Tempering
A toughening process in which martensite is heated to initiate a ferrite-plus-carbide microstructure.
Austenite

Slow cooling
Pearlite
\((\alpha + Fe_3C) + \text{ a proeutectoid phase}\)

Moderate cooling
Bainite
\((\alpha + Fe_3C \text{ phases})\)

Rapid quench
Martensite
\((BCT \text{ phase})\)

Reheat
Tempered martensite
\((\alpha + Fe_3C \text{ phases})\)