

UNENE 901 – Outline

Session 1 – Introduction and Review of Physical Metallurgy

Day 1

Lecture 1 – Introduction

Lecture 2 – Crystallography and Point Defects

Lecture 3 – Dislocations and Boundaries

Lecture 4 – Plastic Instability and Fracture

Day 2

Lecture 5 – Texture, Plasticity and Plastic Anisotropy

Lecture 6 – Creep and Fatigue

Lecture 7 – Residual Stress

Session 2 – Reactors and Radiation Effects

Day 3

Lecture 8 – Physics of Nuclear Reactors

Lecture 9 – Power Reactor Design 1, Reactor Systems

Lecture 10 – Power Reactor Design 2, Safety of CANDU

Discussion of Assignments

Day 4

Lecture 11 – Radiation Effects

Lecture 12 – Evolution of Microstructure and Microchemistry

Lecture 13 – Radiation Induced Deformation 1, without applied stress

Lecture 14 – Radiation Induced Deformation 2, with applied stress

Session 3 – Fuel Channels

Day 5

Lecture 15 – Overview of Fuel Channel Technology

Lecture 16 – Physical Metallurgy of Pressure Tubes and Calandria Tubes

Lecture 17 – Microstructure of Pressure Tubes

Lecture 18 – Deformation of Pressure Tubes

Day 6

Lecture 19 – Pressure Tube Corrosion and Deuterium Ingress

Lecture 20 – Delayed Hydride Cracking and Fracture

Lecture 21 – Calandria Tubes

Discussion of Assignments

Session 4 – CANDU Fuel, Post-Irradiation Examination and Out-Reactor Components

Day 7

Lecture 22 – Design and Manufacture of Fuel

Lecture 23 – Fuel Operation

Lecture 24 – Fuel Performance

Lecture 25 – Examination and Testing of Radioactive Components

Day 8

Lecture 26 – CANDU Feeders

Lecture 27 – Steam Generator Design and Degradation

Lecture 28 – Mitigation of Steam Generator Degradation

Discussion of Assignments