

## **UNENE 901 – Outline**

### **Session 1 – Introduction and Review of Physical Metallurgy**

#### Day 1 Daymond

Lecture 1 – Introduction

Lecture 2 – Crystallography and Point Defects

Lecture 3 – Dislocations and Boundaries

Lecture 4 – Plastic Instability and Fracture

#### Day 2 Daymond

Lecture 5 – Texture, Plasticity and Plastic Anisotropy

Lecture 6 – Creep and Fatigue

Lecture 7 – Residual Stress

Lecture 8 – Phase Diagrams

### **Session 2 – Reactors and Radiation Effects**

#### Day 3 Daymond

Lecture 9 – Physics of Nuclear Reactors

Lecture 10 – Power Reactor Design 1, Reactor Systems

Lecture 11 – Power Reactor Design 2, Safety of CANDU

Tutorial

#### Day 4 Holt

Lecture 12 – Radiation Effects

Lecture 13 – Evolution of Microstructure and Microchemistry

Lecture 14 – Radiation Induced Deformation 1, Zirconium Alloys

Lecture 15 – Radiation Induced Deformation 2, Fast Reactor Steels

### **Session 3 – Fuel Channels**

#### Day 5 Holt

Lecture 16 – Overview of Fuel Channel Technology

Lecture 17 – Physical Metallurgy of Pressure Tubes and Calandria Tubes

Lecture 18 – Microstructure of Pressure Tubes

Lecture 19 – Deformation of Pressure Tubes

#### Day 6 Holt

Lecture 20 – Pressure Tube Corrosion and Deuterium Ingress

Lecture 21 – Delayed Hydride Cracking and Fracture

Lecture 22 – Calandria Tubes

Tutorial

### **Session 4 – CANDU Fuel and Post-Irradiation Examination**

#### Day 7 Holt

Lecture 23 – Design and Manufacture of Fuel

Lecture 24 – Fuel Operation

Lecture 25 – Fuel Performance

Lecture 26 – Examination and Testing of Radioactive Components

### **Session 5 – CANDU Out-Reactor Components**

#### Day 8 Daymond

Lecture 27 – CANDU Feeders

Lecture 28 – Steam Generator Design and Degradation

Lecture 29 – Mitigation of Steam Generator Degradation

Tutorial