



# A.N.T. International Academy

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## ONLINE EDUCATION

## PWR Fuel Engineering

### COURSE DESCRIPTION

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This course covers topics relevant to PWR fuel engineers and technical managers. The course provides information necessary to understand fuel and material behaviour as related to manufacturing and design, operational, reliability and safety and interim dry storage issues. The course involves reading technical reports, watching lectures and participating in online assessments (tests). The course material, including the online content, can be accessed at times convenient for practicing engineers and managers. Information is also provided on the nuclear and thermal-hydraulic behaviour of fuel assemblies because irradiation and temperature are primary factors in the behaviour of fuel materials.



Assessments are done online, with an understanding of the current material (i.e., 70% required correct answers) needed to proceed to the next part of the course. After passing the final online test, a certificate will be issued to the student.

The content is described more in the [Appendix](#).

### AUTHORS/LECTURERS

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The authors/lecturers of the reports and lectures, World Class Experts in their fields, are as follows:

**Alfred Strasser, Richard Collingham, Charles Patterson, Friedrich Garzarolli, Ronald Adamson and Peter Rudling.**

[Read more about the Experts](#)

### COURSE MATERIAL

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The course material was developed by A.N.T. International and consists of earlier recorded A.N.T. International Seminars and associated Reports published by A.N.T. International.

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**Parts of the following Reports are being used in this course:**

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|------------------------------------------------------|------------------------|
| • Fuel Design Review Handbook (FDRH)                 | <a href="#">Sample</a> |
| • Fuel Fabrication Process Handbook Rev 1 (FFPH)     | <a href="#">Sample</a> |
| • Fuel Material Technology Report (FMTR) – Volume I  | <a href="#">Sample</a> |
| • Fuel Material Technology Report (FMTR) – Volume II | <a href="#">Sample</a> |
| • Fuel Material Technology Report (FMTR) – Volume IV | <a href="#">Sample</a> |

## COURSE DURATION

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- Lectures: 16 h
- 1 Test: 1 h

The listed time for the lectures is the actual running time. More time may be needed to digest the information provided in this course.

## CERTIFICATE

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You will automatically receive an email with your certificate that you can print or share on social media. If you need a printed certificate, please don't hesitate to contact us and we can send it to you via regular mail. You reach us at [support@antinternational.com](mailto:support@antinternational.com).

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For more information and/or an offer welcome to contact us at [sales@antinternational.com](mailto:sales@antinternational.com)  
Please also visit our website for the latest updated information, [www.antinternational.com](http://www.antinternational.com)

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# Appendix: Course outline and topics covered

## 1) FUEL DESIGN AND MANUFACTURING

- 1.1 Structure and Components of the Fuel Assembly
- 1.2 Mechanical, thermal hydraulic and nuclear design
- 1.3 Fuel assembly manufacturing
- 1.4 Zr microstructure and effects of irradiation

## 2) FUEL PERFORMANCE DURING NORMAL OPERATION AND ANTICIPATED OPERATIONAL OCCURRENCES, PART I

- 2.1 Fuel reliability
- 2.2 Corrosion and hydrogen pickup,
- 2.3 Axial offset anomaly
- 2.4 Dimensional stability (cladding creep, fuel assembly bowing)

## 3) FUEL PERFORMANCE DURING NORMAL OPERATION AND ANTICIPATED OPERATIONAL OCCURRENCES, PART II

- 3.1 Zr mechanical properties
- 3.2 Effects of hydrides on Zr alloy properties
- 3.3 Pellet cladding interaction
- 3.4 UO<sub>2</sub> and MOX fuel performance
- 3.5 Performance of Ni base alloys in the fuel assembly
- 3.6. Fuel performance codes

## 4) FUEL PERFORMANCE DURING ACCIDENT CONDITIONS AND INTERIM DRY STORAGE

- 4.1 Loss of coolant accident
- 4.2 Reactivity initiated accident
- 4.3 Interim dry storage (overview)



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