

“High Temperature Component Life Assessment”

Course dates 23–25 May 2007

Organised by the Department of Mechanical Engineering,
Imperial College London, London SW7 2AZ

This event has been recognised by the Institute of Materials, Minerals and Mining for CPD

Resumé

There is an increasing demand in the aircraft, power-generation, metals and chemical process industries for improvements in the efficiency, utilisation and lifetimes of high-temperature components, which may be subjected to creep, fatigue and creep-fatigue loading. Increasingly, with the aging of components, there is a need to obtain reliable predictions of the lifetimes of high temperature plant. With its specialised expertise in this area, Imperial College London has developed this course on high temperature component life assessment to provide attendees with essential information on techniques in the field. This well established course incorporates the most recent advances in the subject. It aims to provide a comprehensive understanding of up-to-date procedures for assessing the load carrying capacities of cracked and un-cracked hot engineering components, so that criteria for their safe use and replacement can be specified using damage mechanics and fracture mechanics concepts. Developments in testing methods, analysis of data, and the roles of residual stress and constraint will be examined. These have been established in collaborative European and International studies. Reference will be made to the standards and codes dealing with crack growth test procedures and life assessment. These cover A16, R5 and R6 and the BS7910 and FITNET procedures for defect assessment.

Topics to be addressed during this course include:

- Mechanisms of deformation and fracture
- Reference stress methods
- Damage mechanics concepts
- Fracture mechanics parameters K , J , C^* and $C(t)$
- Stress redistribution times
- Validity criteria for use of parameters
- Experimental and numerical estimates of C^*
- Determination of crack growth properties
- Models of creep crack growth
- Influence of constraint, T and Q parameters.
- Creep/Fatigue interactions
- Prediction of component lifetimes
- Sensitivity and probabilistic analysis
- Effect of ligament damage
- Residual life assessment
- Role of residual stresses
- Deterministic and Probabilistic approaches to life assessment.
- Application to pressure vessels and welds

Tuition will be by way of lectures, examples, case studies and hands on computer demonstrations. Attendees will be encouraged to discuss and present their own problems.

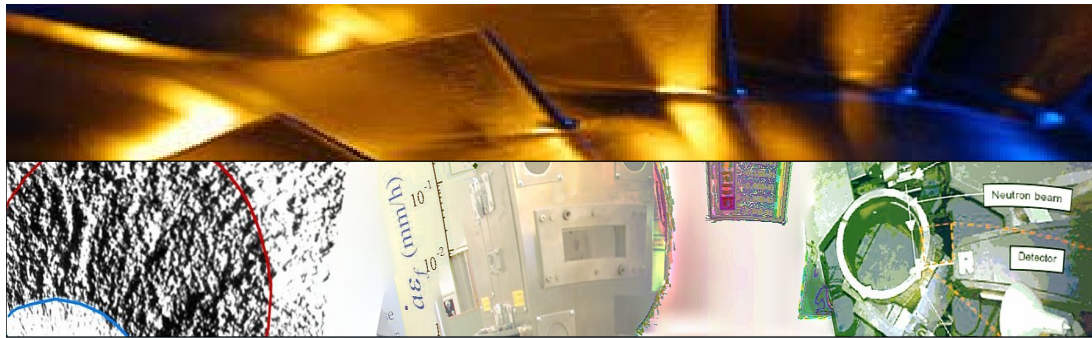
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High Temperature Component Life Assessment

Post experience course 23–25th May 2007

to be held at:

Imperial College London
Mechanical Engineering Department
London, SW7 2AZ
United Kingdom



“High Temperature Component Life Assessment”

Timetable

Wednesday 23rd May: Day 1

08.30–09.30	Registration and Coffee
09.30–10.20	Stress Analysis of Uncracked Bodies
10.20–11.10	Elastic-Plastic Fracture Mechanics Parameters, K , J , T , Q
11.10–11.40	Coffee
11.40–12.20	Creep Fracture Mechanics Concepts, C^* , $C(t)$, Q
12.20–14.20	Lunch
14.20–15.10	Test methods for Fracture, Fatigue and Creep Crack Growth
15.10–6.00	Models of Creep Crack Growth
16.00–17.30	Laboratory visits
18.00–19.00	Welcome Reception

Thursday 24th May: Day 2

09.00–09.50	Creep/Fatigue Interaction
09.50–10.40	Numerical and Reference Stress Estimates of J and C^*
10.40–11.00	Coffee
11.00–11.40	Stress Redistribution Effects and Crack Initiation
11.40–12.30	Failure Assessment Diagrams for Plasticity and Creep
12.30–14.30	Lunch
14.30–15.50	Component Life Assessment Procedures, BS7910
15.50–16.10	Coffee
16.10–17.30	Computer Workshop—R5 practical
18.45	Course Dinner

Friday 25th May: Day 3

09.00–09.40	Role of Residual Stress
09.40–10.20	Behaviour of Short Cracks
10.20–11.00	Creep-Fatigue Failure Case Studies
11.00–11.30	Coffee
11.30–12.20	Comparison of A16, R5, R6 and BS7910 Methods
12.20–14.20	Lunch
14.30–15.00	Review and General Discussion
16.00–16.20	Coffee

Who should attend?

The course is suitable for engineers, managers, materials scientists and technical personnel involved in design, manufacture, test and operation of a wide range of high temperature components. Attendees should have a degree or equivalent experience.

A certificate of attendance will be awarded to each participant at the end of the course.

The lecturers on this course have extensive experience of materials modelling, testing and lifetime assessment methods for a wide range of engineering applications.

George Webster is Professor of Engineering Materials in the Mechanical Engineering Department at Imperial College London. He has previously worked in industry at English Electric and Pratt and Whitney Aircraft. He has extensive experience of the deformation and fracture behaviour of a wide range of materials and components of relevance to the electric power, chemical and aerospace industry.

Kamran Nikbin holds a Royal Academy of Engineering/British Energy Professor Chair in “Structural Integrity” in the Mechanical Engineering Department at Imperial College London. He is responsible for establishing procedures for determining the safety of high temperature components using fracture mechanics concepts, limit analysis and finite element computer methods. Much of his research is carried out in association with industry in Europe, Japan and the USA.

Bob Ainsworth is a visiting Professor at Imperial College and currently Head of the Assessment Technology Group within British Energy. His research is mainly concerned with the development of criteria for determining the significance of defects in nuclear power plant and engineering equipment. He is actively involved in the development of the R6, R5 and high temperature defect assessment procedures generally.

Peter Skelton until recently worked as a Research Fellow in the Mechanical Engineering Department at Imperial College London, having previously worked with the former CEGB and then National Power. His primary experimental interests lie in the fields of short crack growth, low cycle fatigue and thermo-mechanical fatigue.

Noel O'Dowd is Professor of Mechanical Engineering at the University of Limerick, Ireland. He received his PhD in solid mechanics from Brown University, in the USA in 1992. He subsequently worked as a Research Fellow at the California Institute of Technology, USA before joining Imperial College London in 1993. His main research interests are in the area of fracture mechanics at low and high temperatures and the application of computational methods.

David Smith is a Professor of Engineering Materials at Bristol University. His academic interests lie in fracture of materials and locked-in stresses in engineering components. He is the Head of the Solid Mechanics Research Group which currently consists of six academics. The group is funded by Industry, EC and EPSRC. Recent projects related to power generation and nuclear propulsion critical technology programme.

Course Booking in the first instance can be made by
EMAIL: p.cook@imperial.ac.uk or FAX: +44 (0)20 7594 7107 ref: HTCLA, c/o Ms Pamela Cook
And then by completing and returning the attached registration form to the address below.

Ms Pam Cook (HTCLA-course)

Mechanics of Materials Division
Mechanical Engineering Department
Imperial College London
South Kensington campus
London, SW7 2AZ

Detailed joining instructions, including a map, will be sent to all participants 10–14 days prior to the commencement of the course. While every attempt will be made to ensure the material arrives in time, it is the participants' responsibility to contact Imperial College at the address below if no information has been received.

Places on the course are limited therefore EARLY BOOKING IS ADVISABLE.

Accommodation is available in local hotels within walking distance of the College. This is additional to the course fee and participants are responsible for the reservation and payment of their own accommodation bills. For further details and reservations, please contact:

Hotel Booking Service

Imperial College London Conference Office
Watt's Way, Prince's Gardens, London SW7 1LU.
Tel: +44 (0)20 7594 9507/11; Fax: +44 (0)20 7594 9504/5;

Email: accommodationlink@imperial.ac.uk

Additional accommodation information is available at: www.imperial.ac.uk/conferences and follow the link to South Kensington.

The course will take place at the Dept of Mechanical Engineering, Imperial College London. The College is located in a pleasant part of London, close to Hyde Park, the Royal Albert Hall and world renowned museums. Imperial College London celebrates its centenary in 2007.

Further information regarding the course technical content may be addressed to:

Prof. G.A. Webster or Prof. K. Nikbin
Mechanical Engineering Department
Imperial College London, South Kensington campus, London, SW7 2AZ
Tel. +44 (0)20 7594 7133; Fax: +44 (0)20 7594 4017;

Email: g.webster@imperial.ac.uk or k.nikbin@imperial.ac.uk

Queries regarding registration and other administrative matters to be directed to:

Ms Pamela Cook; (ref: HTCLA-course)
MoM Division, Imperial College London, South Kensington campus, London SW7 2AZ
Tel. +44 (0)20 7594 7080, Fax: +44 (0)20 7594 7107; **Email:** p.cook@imperial.ac.uk

Note: A 10% administration fee will be levied for cancellations up to two weeks prior to the start of the course. Cancellations thereafter will be liable to the loss of the full fee. A Notice to cancel must be given in writing, email, letter or fax. The College reserves the right to cancel or postpone the course at short notice. It will endeavour to provide participants with as much notice as possible, but will not accept liability for any costs incurred by participants as a result of the course being cancelled or postponed. If a course is cancelled, fees will be refunded in full.

High Temperature Component Life Assessment 23-25th May 2007

Please reserve a place on this course (copy for additional applicants)
Delegate's details: (Please let us know if this address is NOT for joining information)

TITLE.....
FIRST NAME(S).....SURNAME.....
OCCUPATION/JOB TITLE.....
ORGANISATION.....
WORK ADDRESS.....
.....POSTCODE.....COUNTRY.....
TEL.....FAX.....Email.....

Course Fees (VAT Exempt):

Please note all fees must be received BEFORE the course start date

Early registration before 15 April 2007 **£730**

Late registration after 15 April 2007 **£800**

Registration of more than two persons from the same organisation **£690** each

Methods of Payment: OVERSEAS DELEGATES SHOULD EITHER PAY BY STERLING BANK DRAFT DRAWN ON A UK BANK, OR ADD £25 TO COVER BANK CHARGES

CHEQUE: I/We enclose the fee of

* PLEASE MAKE DRAFT/ CHEQUES FOR COURSE FEES PAYABLE TO "IMPERIAL COLLEGE" *

CREDIT CARD: Please charge the following credit card for the total fee of:.....

Card No: Expiry Date:.....

Card in the name of: Signed:.....

**Type of card: VISA MASTERCARD SWITCH DELTA (these cards ONLY)

INVOICE: Please invoice the following person/organisation for the sum of:.....

INVOICE REFERENCE/ORDER NUMBER.....

ORGANISATION.....

ADDRESS.....

.....

FOR THE ATTENTION OF..... POSITION.....

Other information: PLEASE DELETE AND TICK AS REQUIRED

I will/will not require special meals (e.g. Vegetarian).

Please give details.....

I will/will not need special facilities for a disability.

Please give details.....

For accommodation booking please contact Imperial College London Conference Link on +44(0)20 7594 9494; Email: conferenceklink@imperial.ac.uk

I agree that if payment is not received from the above organisation, I will be personally liable for the full fee;

APPLICANT'S SIGNATURE, DATE:.....

Please send completed form (or original if faxed or emailed) to:

Pamela Cook, (HTCLA-course),

MoM division Secretary,
Mechanical Engineering,
Exhibition Road, London SW7 2AZ, UK.
Tel: +44 (0)20 7594 7080; Fax: +44 (0)20 7594 7017; Email: p.cook@imperial.ac.uk