



Integrated Systems Research Inc., *presents*

Practical Design Technology for Fatigue

This two day seminar covers essential engineering concepts required for developing robust solutions to structural fatigue. The course is intended for mechanical engineers who are responsible for the design and review of cyclically loaded structures. The material is organized around the three major design variables engineers work with in developing cost-effective structural solutions. These variables are LOADS, MATERIALS and GEOMETRY. The seminar guides the engineer through a structured process in evaluating the relative benefits each design variable provides in developing cost effective structural solutions to fatigue.

Seminar Content

Material Issues

- ***Metallic Alloys***

- Crystalline Structures
- Grain Structures
- Ramberg-Osgood Model

- ***Mechanical & Life Properties***

- Monotonic and Cyclic
- Strain Life Parameters
- Universal Slope Models

- ***Weld & HAZ Characteristics***

Geometry Issues

- ***Singularities***

- ***Stress Concentrations***

- ***Characteristic Dimensions***

- ***Net Section Influences***

- Shell Membrane Behavior
- Beam Behavior

- ***Weld Joint Characteristics***

- Shear Transfer
- Moment Transfer

Loading Issues

- ***Strain Controlled***

- Thermal Stresses
- Residual Stresses

- ***Load Controlled***

- Harmonic Loads
- Suddenly Applied Loads

- ***Environmental Factors***

- ***Load Histories***

- Peak-Valley
- Proportional Loading
- Non-Proportional Loading

- ***Stress & Strain Space***

- Mohr's Circle

- ***Rainflow Counting***

Life Predictions

- ***Stress Based Methods***

- HCF & LCF

- ***Strain Based Methods***

- Local Strain Approach
- Neuber's Rule
- SED Models

- ***Coffin-Manson Equation***

- Morrow Mean Stress
- SWT Mean Stress Model

Attendees taking the two day seminar should have a BS in engineering and some familiarity with spreadsheet operations. Exercises using EXCEL spreadsheets will be provided as well as finite element examples. These applications include macros for performing peak-valley event histories, rainflow counting and finding the roots of non-linear equations. A 60 page reference manual is also provided.

Case Studies Presented :

- ***Redesign of Suspended Roller Coaster Backbone Saddles***
- ***Redesign of Running Rail Ties for Indoor Coaster***