

Fatigue and Fracture Research

The **Fatigue and Fracture Research Laboratory (FFRL)** is housed in the Department of Mechanical Engineering. Led by Professor and Department Chair Ali Fatemi, the lab focuses its efforts on experimental characterization, as well as computational and analytical modeling for fatigue life analysis and prediction.

-Research Interests-

The FFRL team is interested in both basic research that advances understanding of fundamental fatigue damage mechanisms, as well as in the applied areas that facilitate applications of the knowledge learned to the design and life prediction of engineering components and structures. Broad areas of interest include:

- Fatigue of materials and structures;
- Fracture mechanics;
- Additive manufacturing; and
- Mechanical behavior of materials including metals, polymers, and elastomers.

-Key Contributions-

Professor Fatemi is a leading expert in fatigue and fracture of materials and has conducted research projects on these topics for many companies in the automotive, aerospace, power generation, and defense industries for more than 30 years. His work has resulted in several well known fatigue damage and life prediction models used in fatigue design and failure analysis by different industry sectors, including the Fatemi-Socie multiaxial fatigue model. In addition to metallic materials, our research on fatigue and fracture includes polymeric materials, elastomers, and composite materials. His research has been sponsored by many companies and organizations including General Motors, Pratt & Whitney, Electricite de France, Forging Industry Association, American Iron and Steel Institute, Army Research Lab, and NAVAIR.

For more information please visit:
<http://www.memphis.edu/me/faculty/afatemi.php>

Ali Fatemi, Ph.D.
afatemi@memphis.edu
(901) 678-2257



-Available Resources-

Advanced laboratory equipment includes several servo-hydraulic testing systems for both uniaxial and multiaxial loadings. In addition, crack development and detection systems, mechanical and video extensometers, and optical and scanning microscopes are also available.

-Recent Publications-

[On the application of a critical plane approach to the life assessment of welded joints](#), G Marulo, F Frendo, L Bertini, A Fatemi - Procedia Engineering, 2018

[Fatigue Design with Additive Manufactured Metals: Issues to Consider and Perspective for Future Research](#), R Molaei, A Fatemi - Procedia Engineering, 2018

[Multiaxial variable amplitude fatigue life analysis using the critical plane approach, Part II: Notched specimen experiments and life estimations](#), NR Gates, A Fatemi - International Journal of Fatigue, 2018

[Tensile behavior and modeling of short fiber-reinforced polymer composites including temperature and strain rate effects](#), S Mortazavian, A Fatemi - Journal of Thermoplastic Composite Materials, 2017

[Multiaxial fatigue behavior of wrought and additive manufactured Ti-6Al-4V including surface finish effect](#), A Fatemi, R Molaei, S Sharifimehr, N Phan... - International Journal of Fatigue, 2017

[Cyclic deformation and fatigue behavior of carburized automotive gear steel and predictions including multiaxial stress states](#), B Jo, S Sharifimehr, Y Shim, A Fatemi - International Journal of Fatigue, 2017

[Application of the critical plane approach to the torsional fatigue assessment of welds considering the effect of residual stresses](#), K Hemmesi, M Farajian, A Fatemi - International Journal of Fatigue, 2017