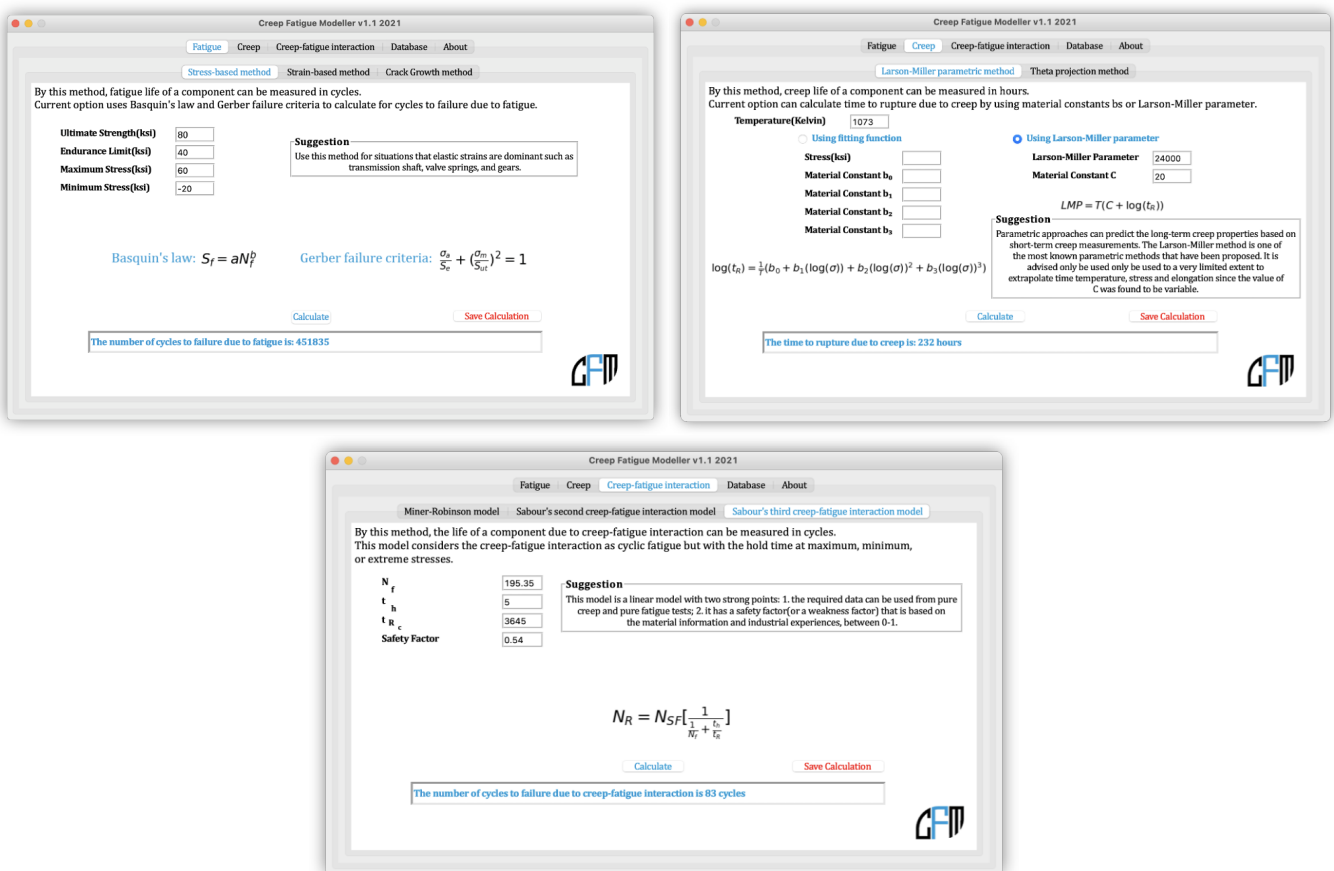


# Creep-Fatigue Modeler

A Desktop Software and Web Application Developed for Estimating Creep, Fatigue and Creep-Fatigue Interaction Lifetime

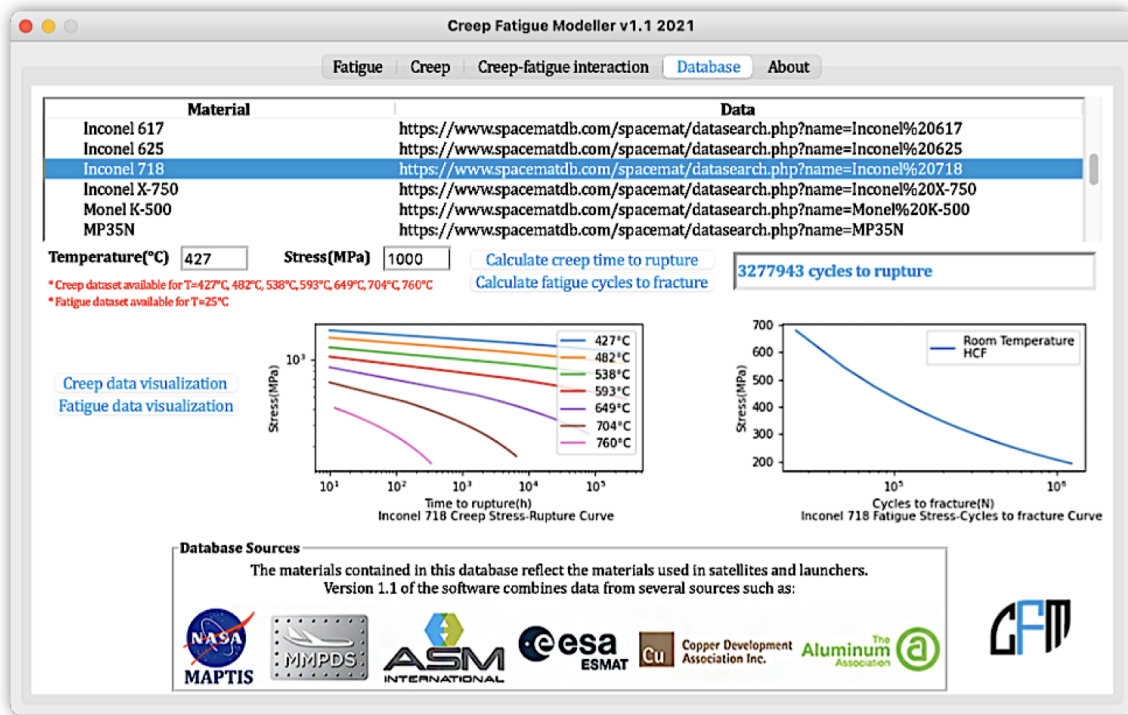
Creep-Fatigue Modeler, CFM in short, is a software for engineering data analysis with a concentration on fatigue, creep, and creep-fatigue interaction. CFM has been developed as a program to cover commercial CAA gaps in estimating fatigue lifetime, creep time to rupture, and creep-fatigue interaction lifetime estimation.



## Creep-Fatigue Modeler V1.1, Desktop Software

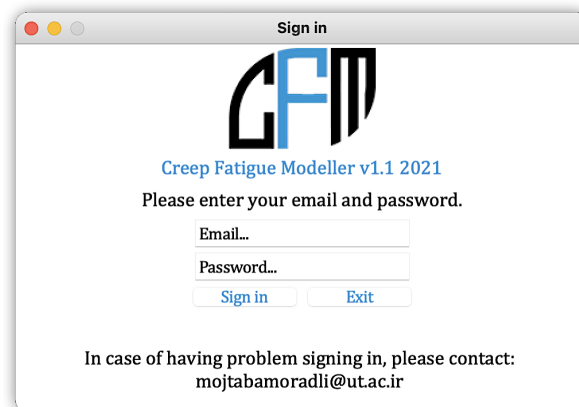
Version 1.1 of CFM software can estimate fatigue lifetime, creep time to rupture, and creep-fatigue interaction lifetime with several known models, such as Stress-based, Strain-based, and Crack Growth methods for fatigue; Larson-Miller parametric and Theta Projection methods for creep; Miner-Robinson and Sabour's models for creep-fatigue interactions.

CFM V1.1 has been developed using only Python, and it has a built-in creep and fatigue material database for heat-resistant metals. The Software is tested and verified for different materials, although it was first developed specifically for spacecraft's metallic superalloy structures.

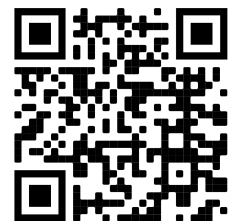


## Creep-Fatigue Modeller V1.1, Heat Resistant Materias' Database

CFM can be customized to limit access, and it is a secure place for your tests data and computations...



Contact [contact@mojtabamoradli.ir](mailto:contact@mojtabamoradli.ir) to learn more about how CFM software can be used or tailored to solve your engineering problems.



Click or Scan to Watch V1.1 Demo on Youtube



Home
Fatigue
Creep
Creep-Fatigue Interaction

Stress-based method
Strain-based method
Crack growth method

By this method, fatigue life of a component can be measured in cycles. Current option uses Mason-Coffin Relationship or Smith, Watson, and Topper mean stress correction model to calculate for cycles to failure due to fatigue.

Manson-Coffin relationship:  $\frac{\Delta\epsilon}{2} = \frac{\sigma_f'}{E} (2N_f)^b + \epsilon_f' (2N_f)^c$

SWT model:  $\frac{\Delta\epsilon}{2} \sigma_{max} = \frac{(\sigma_f')^2}{E} (2N_f)^{2b} + \sigma_f' \epsilon_f' (2N_f)^{b+c}$

**Suggestion:** Use this method for situations that plastic strains are significant. This method gives a superior result for variable amplitude loading and short fatigue lives; For example in high temperature applications with creep-fatigue.

15809.34

572.8991

1.5

-0.761

-0.151

100

44.6716

0.0058

Calculate

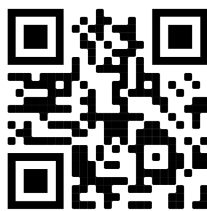
The number of cycles to failure due to fatigue is: 710093.009915859

## Creep-Fatigue Modeler V1.2, Web Application

CFM version 1.2 is a web application with functionality similar to CFM V1.1 desktop software, developed using JavaScript and PHP in the back-end and several different programming languages and frameworks in the front-end.

The new version has something more to offer on some fronts and lacks some features like the material database.

The future goal for CFM is to become able to perform creep, fatigue, and creep-fatigue interaction lifetime estimation with the use of even more existing mathematical models.



**Click or Scan to Watch  
V1.2 Demo on Youtube**

Home
Creep
Creep-Fatigue Interaction

Larson-Miller-parametric method
Thou's-projection method

By this method, creep life of a component can be measured in hours. Current option can calculate time to rupture due to creep by using material constants  $b_1$  or Larson-Miller parameter.

**Suggestion:** Parametric approaches can predict the long-term creep properties based on short-term creep measurements. The Larson-Miller method is one of the most known parametric methods that have been proposed. It is advised only be used to a very limited extent to extrapolate time temperature, stress and elongation since the value of  $C$  was found to be variable.

Using fitting function  
 Using Larson-Miller parameter

$\log(t) = \frac{1}{b_1}(b_2 + b_3(\log(t))) + b_3(\log(t))^2 + b_3(\log(t))^3$

Stress(kal)

Temperature(Kelvin)

Material Constant  $b_1$

Material Constant  $b_2$

Material Constant  $b_3$

Material Constant  $b_4$

Calculate

Home
Fatigue
Creep
Creep-Fatigue Interaction

Stress-based method
Strain-based method
Crack growth method

By this method, fatigue life of a component can be measured in cycles. Current option uses Mason-Coffin Relationship or Smith, Watson, and Topper mean stress correction model to calculate for cycles to failure due to fatigue.

Manson-Coffin relationship:  $\frac{\Delta\epsilon}{2} = \frac{\sigma_f'}{E} (2N_f)^b + \epsilon_f' (2N_f)^c$

SWT model:  $\frac{\Delta\epsilon}{2} \sigma_{max} = \frac{(\sigma_f')^2}{E} (2N_f)^{2b} + \sigma_f' \epsilon_f' (2N_f)^{b+c}$

**Suggestion:** Use this method for situations that plastic strains are significant. This method gives a superior result for variable amplitude loading and short fatigue lives; For example in high temperature applications with creep-fatigue.

Module of Elasticity(kal)

Fatigue Strength Coefficient

Fatigue Ductility Coefficient

Fatigue Ductility Exponent

Fatigue Strength Exponent

Maximum Stress(kal)

Minimum Stress(kal)

Strain Range

Calculate

Home
Creep-Fatigue Interaction

Morrow-Robinson model
Sobour's second creep-fatigue interaction model
Sobour's third creep-fatigue interaction model

By this method, the life of a component due to creep-fatigue interaction can be obtained. According to this model, by assuming that the creep behavior is controlled by the mean stress and that the fatigue behavior is controlled by the stress amplitude, the two processes combine linearly to produce failure. According to the linear failure prediction rule, failure is predicted to occur under combined isothermal creep and fatigue if:

$$\frac{\sigma_a}{S_f} + \frac{\sigma_m}{\sigma_{cr}} \geq 1$$

**Suggestion:** This model is an extension to Goodman theory, and can estimate creep-fatigue life in periods less than 1000 cycles and more than 100000 cycles whenever two assumptions can be considered.

Ultimate Strength(kal)

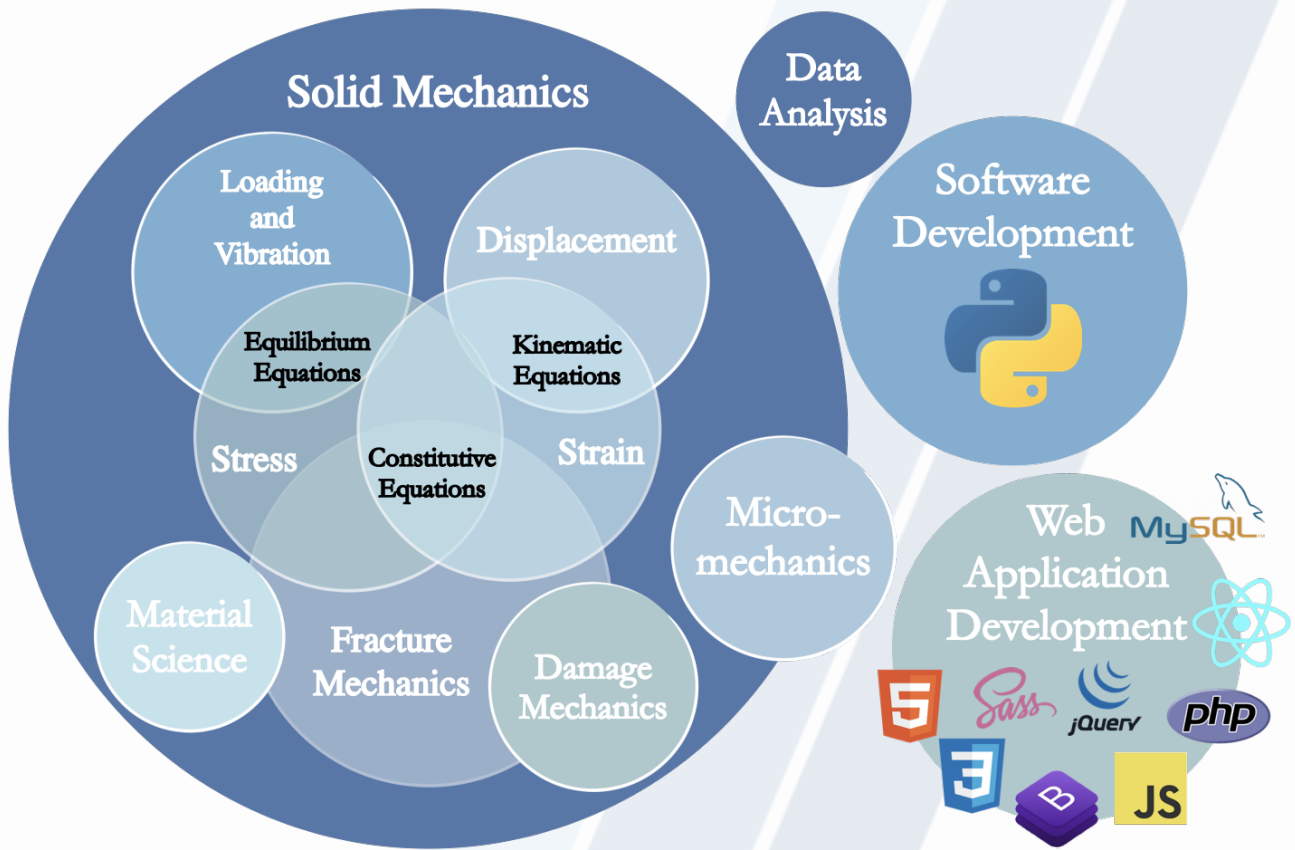
Alternating Stress(kal)

Mean Stress(kal)

Creep Strength(kal)

Calculate

# The Multidisciplinary Scope of Work



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