Unit information

Program	Mechanical Science (53001010053P0)
Course unit	Fatigue of Materials
Unit code	PCMEC
Unit number	2120
Credit points	4
Period	01/01/2012 -
Professor	Jorge Luiz de Almeida Ferreira
Prerequisites	No

Unit outline

Objective:

Present the fundamental concepts of the mechanical behavior of metallic materials subject to cyclic loading. Develop analytical methods for designing and predicting fatigue life. Discuss the recent advances in this area of knowledge brought about by improvements in test methods, data analysis and modeling, with a view to carrying out projects and analyzing structural integrity.

Purpose:

Fatigue is the leading cause of component failure in service. For this reason, it is essential for engineers and professionals who work with design and structural integrity analysis of mechanical components to understand the mechanisms that control the fatigue process. PCMEC has consolidated a research group dedicated to scientific and technological development in this area, which has contributed significantly, not only in training new researchers, but has also presented innovative solutions. Thus, the discipline serves to standardize the students' knowledge in this subject, guaranteeing a solid basic training in this subject and allowing their involvement in more advanced studies in this area.

Contents:

Module 1 - Review of solid mechanics; **Module 2** - Basic concepts of fatigue; **Module 3** - S-N Method; Module 4 - ϵ-N method; **Module 5** - Fatigue analysis under variable loading conditions.

Assessment

The evaluation process is carried out based on three partial mentions. Each partial mention takes into account student performance on periodic tests (usually 3 tests), individual assignments, and projects.

Questions of exams, works and periodic tests will be evaluated considering an evaluation grade, whose value is calculated considering the following weighting:
Assessment grade = (Grade for clarity of question) * (Grade for conceptual development) * Grade for level of depth of conclusions/discussions on results), where:

Clarity grade: assumes the value 0 (for unreadable texts) or 1 (for readable texts).

Development grade: assumes values between 0 (when the solution is presented without development or with development incompatible with the problem statement or with conceptual errors) to 10 (development steps completely explained and justified without conceptual errors).

Conclusions grade: assumes values between 0 (no conclusions or discussions) or 1 (conclusions/discussions elaborated consistently or critically in relation to the results obtained throughout the development of the question)

Evaluation criteria for periodic tests, works and individual projects: The grade of the work will be calculated through the weighted average of the works developed until the last class before each test. (the weighting coefficients will be defined in each work)

Criterion for formation of the final mention and approval: The student's approval criterion will be based on the harmonic mean of the partial mentions

Mentions will be attributed to students based on the final grades obtained, in accordance with UnB's criteria for mentions. Missing cases will be solved by the professors of the subject.

Obs:

ADHERENCE OF THE DISCIPLINE TO THE AREA OF ASSESSMENT OF ENGINEERING III (Mechanics; Production; Naval and Oceanic; Aerospace)
The discipline addresses issues related to the fatigue of materials, aiming at questions related to the research line Fatigue, Fracture and Materials

Reference:

1) .E. DOWLING, S.L. KAMPE, M.V. KRAL. Mechanical Behavior of Materials. Hoboken: Pearson Education. Fifth Edition, 2019, 946p. **2)** J.T.P. CASTRO, M.A. MEGGIOLARO Fadiga - Técnicas e Práticas de Dimensionamento Estrutural sob Cargas Reais de Serviço: Vol. I - Iniciação de Trincas (Portuguese Edition). Createspace Books, 2009, 494p. **3)** J.T.P. CASTRO, M.A. MEGGIOLARO Fadiga - Técnicas e Práticas de Dimensionamento Estrutural sob Cargas Reais de Serviço: Vol. II - Propagação de Trincas, Efeitos Térmico e Estocásticos (Portuguese Edition). Createspace Books, 2009, 578p. **4)** Y.LEE, J. PAN, R. HATHAWAY, M. BARKEY., Fatigue Testing and Analysis: Theory and Practice. Elsevier, 2005.. **5)** LALANNE, CHRISTIAN. Mechanical Vibration and Shock Analysis, Fatigue Damage. United Kingdom, Wiley, 2014.