PLANNING

Program	Mechanical Sciences (53001010053P0)
Name	Fracture Mechanics
Code	PCMEC
Number	2152
Credits	4
Period	01/01/2012
Professor	José Alexander Araújo
Obrigatory	No

CONTENTS

Objetives:

The aim of this discipline is to introduce the basic concepts of the Linear Elastic Fracture Mechanics, under an applied engineering framework. The course involves laboratory activities where several of the concepts and material properties discussed during the classes are obtained and measured. Numerical activities are also considered to compute stress intensity factors and crack propagation life for more complex structures.

Justification:

The course begins by the presentation of the celebrated stress intensity factor, K, under different loading modes. The validity of application of K is discussed together with the different approaches to compute the plastic zone size ahead of the crack tip.

The Grifith energy balance approach is then introduced and the relation between stress intensity factor and compliance is presented. To conclude the fatigue crack growth phenomenon and its relation with the stress intensity factor is detailed. Tests (following ASTM standards) for the determination of the fracture toughness, crack growth rate versus stress intensity factor range, and the threshold stress intensity factor are carried out.

Content:

Chapter 1 – Introduction to Elasticity; **Chapter 2 –** Stress intensify factor and loading modes for cracked bodies; **Chapter 3 –** Plasticity at the crack tip; **Chapter 4 –** Energy Balance Approach; **Chapter 5 –** Fracture toughness: tests and ASTM standards; **Chapter 6 –** Fatigue crack growth rate: tests and numerical approach.

Evaluation:

List of exercises (**50% da nota)**; - Test reports (**30% da nota)**; Class presentation **(20% da nota)**

Remarks:

Bibliography:

1) COATES, C. SOOKLAL, V., Modern Applied Fracture Mechanics. ISBN 9780367501259 Published August 2, 2022 by CRC Press.

2) SAXENA, A., Advanced Fracture Mechanics and Structural Integrity. ISBN 978-1138544260 Published February 13, 2019 by CRC Press.

3) ANDERSON, T.L., Fracture Mechanics Fundamentals and Applications (4th Edition), Fourth Edition ISBN 9781498728133, Published February 23, 2017 by CRC Press

4) CASTRO, J. T. P; MEGGIOLARO, M. A. Fatigue Design Techniques: Vols. I, II, and III. Createspace Independent Publishing Platform, 2016..

5) JANSSEN, M., Zuidema, J., Wanhill, R. J. H., Fracutre Mechanics, 2nd Edition, VSSD, 2006.

6) BROEK, D., Elementary Engineering Fracture Mechanics, Martinus Nijhoff, 1986.