

# Grand Challenges Scholars Program Workshop

*GCSP fostering modern global engineer competencies including entrepreneurship*

National Academy of Engineering & Academia Brasileira de Engenharia &  
Academia Brasileira de Ciências

The logo consists of the text "ENG" in a bold, sans-serif font above the text "200" in a larger, bold, sans-serif font. Both are white and set against a dark blue square background with a thin white border.

**ENG  
200**

## PROGRAMA DE INOVAÇÃO NA EDUCAÇÃO EM ENGENHARIA

ESCOLA DE ENGENHARIA DA UFMG

Prof. Alessandro F. Moreira, PhD

UFMG Vice-President

August 2019

# The 21st Century CHALLENGES!

## GRAND CHALLENGES FOR ENGINEERING



Make solar  
energy  
economical



Provide energy  
from fusion



Develop carbon  
sequestration  
methods



Manage the  
nitrogen cycle



Provide access to  
clean water



Restore and  
improve urban  
infrastructure



Advance health  
informatics



Engineer better  
medicines



Reverse-engineer  
the brain



Prevent nuclear  
terror



Secure  
cyberspace



Enhance virtual  
reality



Advance  
personalized  
learning



Engineer the tools  
of scientific  
discovery



# **The CHALLENGES are always THE SAME!!!**

*The future of skills development and  
universities???*

*Need for innovative and entrepreneur engineers!*

*Need to adapt to new curricular policy!*

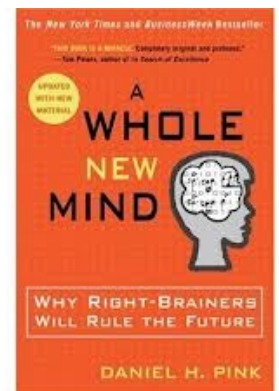
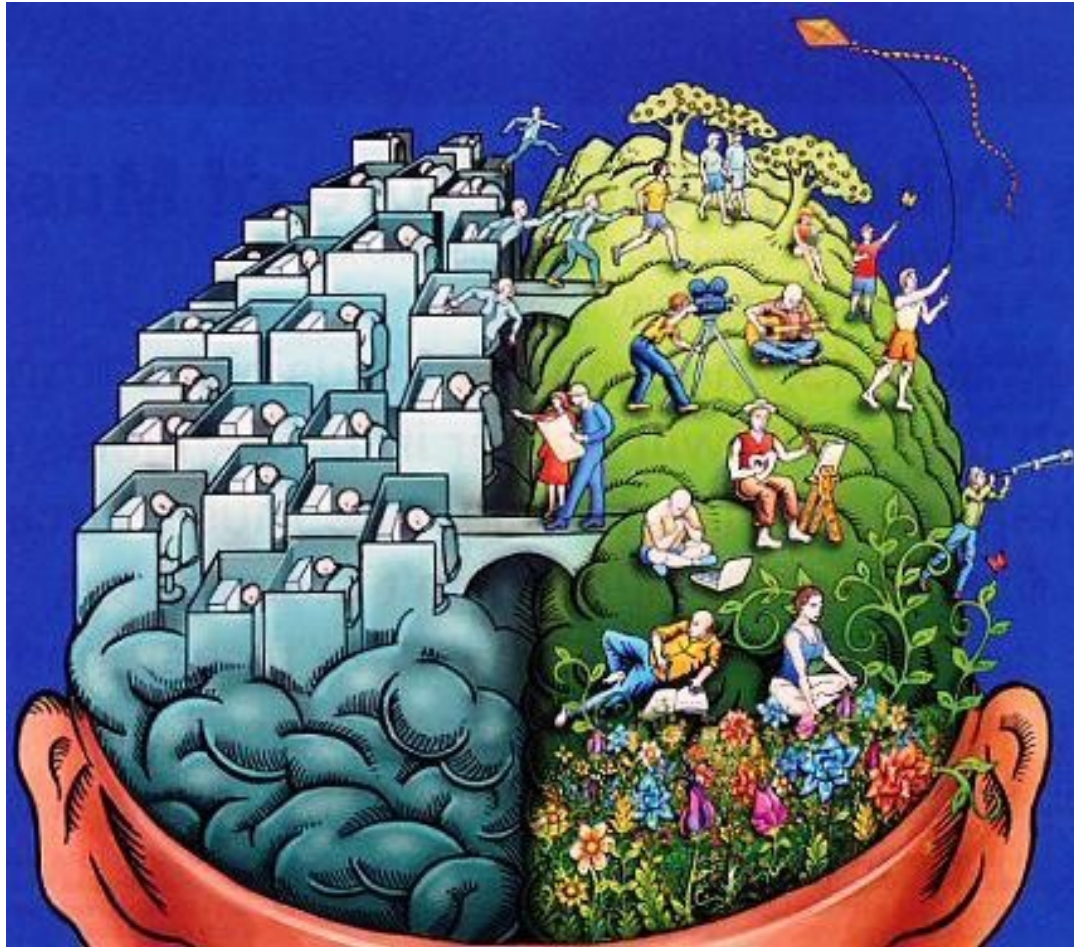
*New directions for professional regulation!*

# **Innovation Program for Engineering Education**

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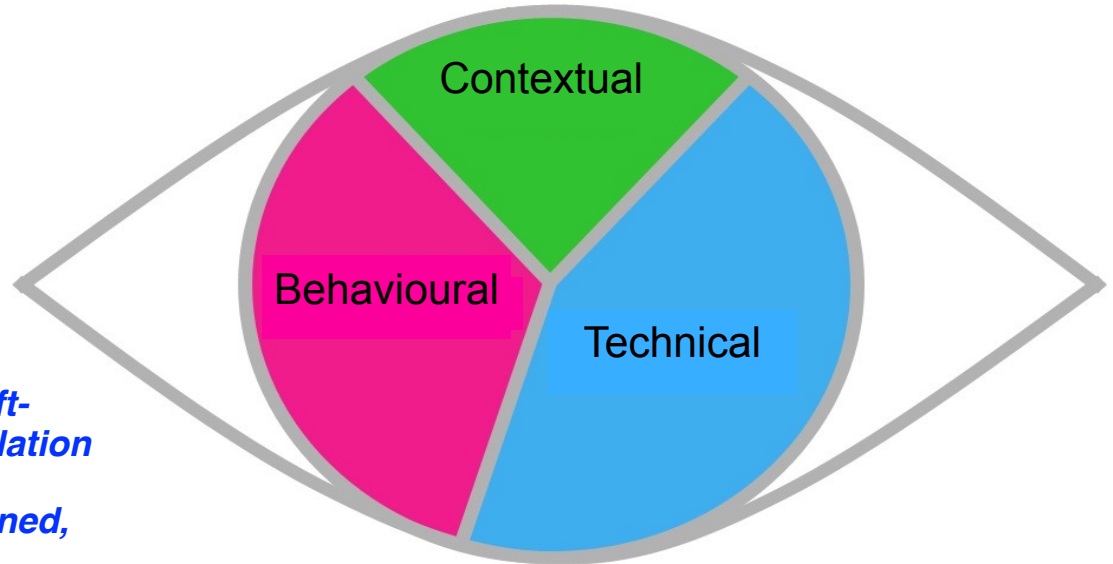
***ENG  
200***

# Looking for a Holistic Engineering



# A view, including...

## Feasibility & Viability & Desirability



*“We recognize that engineers are not left-brained equation solvers working in isolation from human needs, challenges, and opportunities. Engineers are whole-brained, whole-bodied human beings*

...

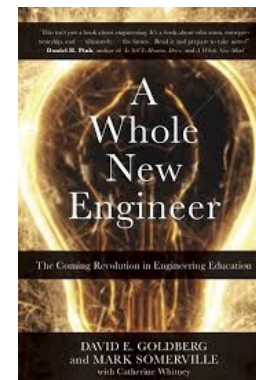
*whole new engineers*

...

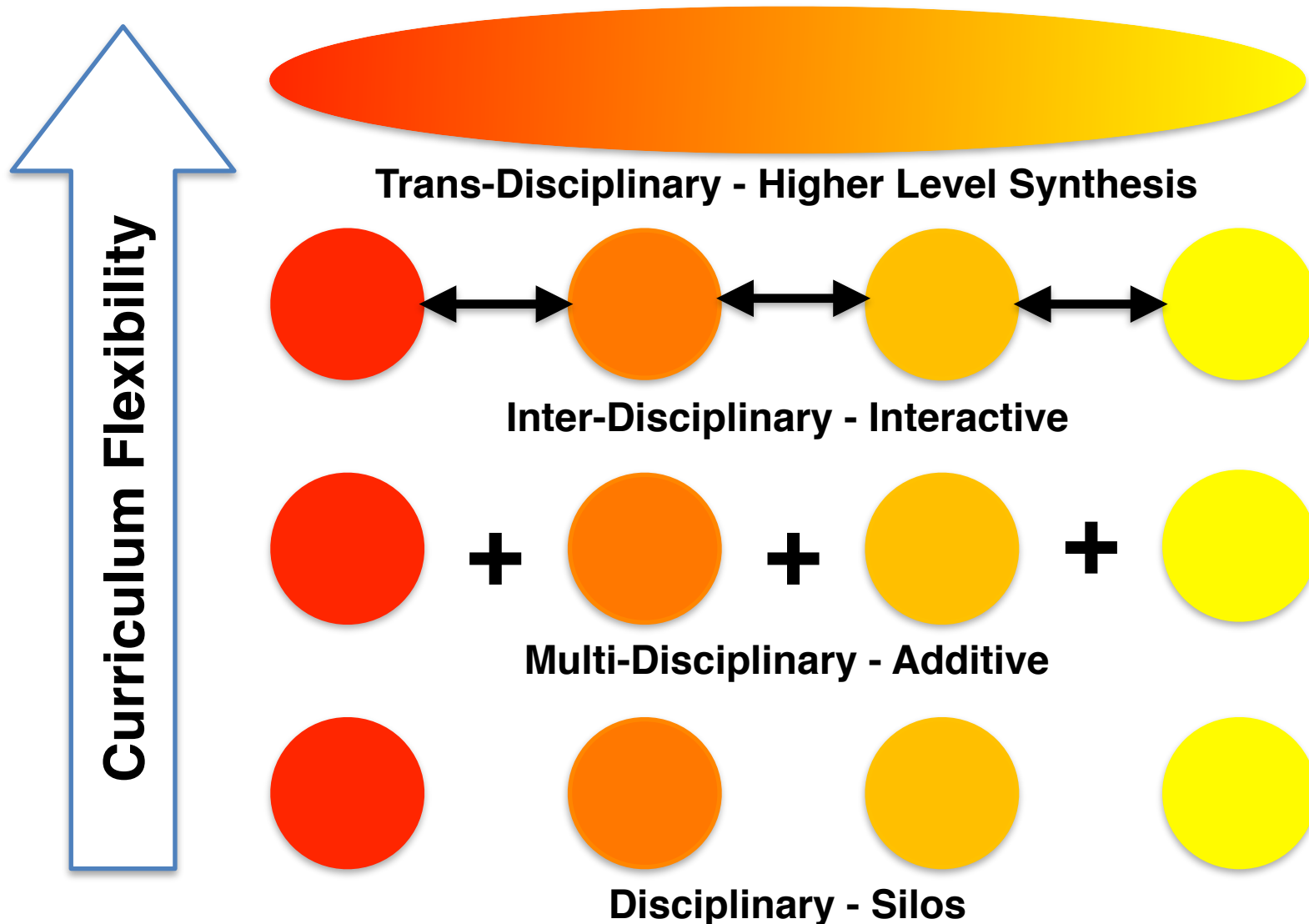
*who come fully assembled, ready for some of the most important collaborative action of our times.”*

**David Goldberg**  
**BigBeacon Inc.**

**A Movement to Transform Engineering Education**



# One Goal: a more Flexible Engineering Curriculum





# Engineering Innovation Beacons



&





# How to make the engineering innovation coalition?



# ENG200 Program Activities

## Education

- Complementary Activities
- Teaching
- Curriculum

## Infrastructure

- Communication
- Events
- Infrastructure
- Institutions

# Cases of Success



FIEMG Internship Programs




































Complementary  
Academic Activities  
Credit Policy

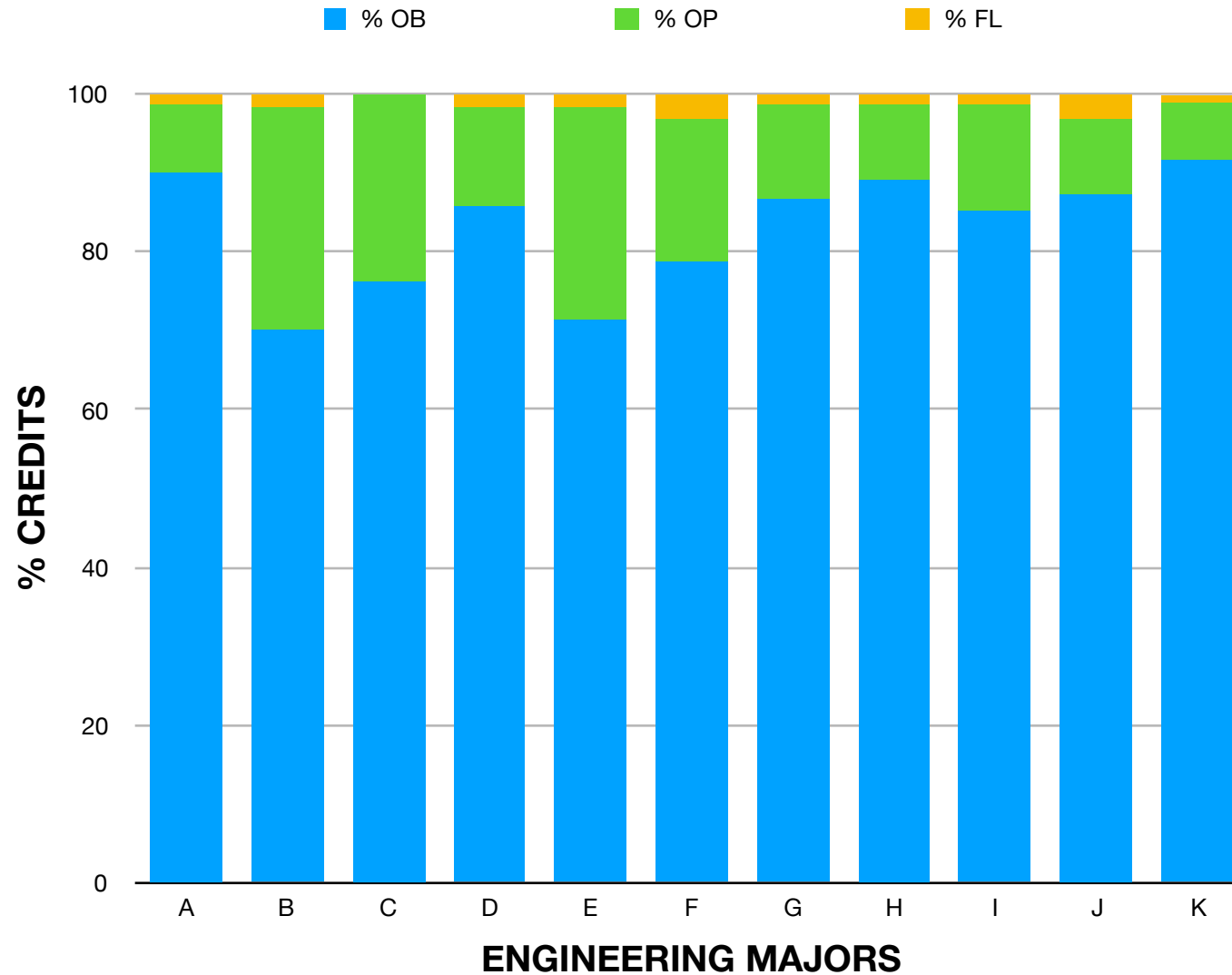


# Cases of Success

## EXPO 17 ENGENHARIA

| CURSOS / INICIATIVAS  |                       | EMPRESAS JÚNIORS  |   |   |   |   |   |   | MOVIMENTO ESTUDANTIL  | ASSOCIAÇÕES   |   |   |  |   | EQUIPES DE COMPETIÇÃO   |   |   |   |   |   |   | PROJETOS DE EXTENSÃO  |   |   |   |   | EVENTO |
|---|-----------------------|---|---|---|---|---|---|---|---|---|---|---|--|---|---|---|---|---|---|---|---|---|---|---|---|---|--------|
|   |                       |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |        |
|    | AEROESPACIAL          | ✓   |   |   |   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓  | ✓   |   | ✓   | ✓   |   | ✓   | ✓   |   | ✓   |   | ✓   |   | ✓   |        |
|    | AMBIENTAL             |   | ✓   |   |   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓  |   |   | ✓   | ✓   |   |   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   |        |
|    | CIVIL                 |   | ✓   |   |   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓  |   |   | ✓   | ✓   |   |   | ✓   | ✓   |   | ✓   | ✓   | ✓   | ✓   |        |
|    | CONTROLE DE AUTOMAÇÃO |   |   | ✓   |   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓  | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |   | ✓   |   | ✓   | ✓   |        |
|    | ELÉTRICA              |   |   | ✓   |   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓  | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |   | ✓   |   | ✓   |        |
|    | MECÂNICA              |   |   |   | ✓   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓  | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |   | ✓   |   | ✓   | ✓   |        |
|    | METALÚRGICA           |   |   |   |   | ✓   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓  |   |   | ✓   | ✓   |   |   | ✓   | ✓   |   | ✓   |   | ✓   | ✓   |        |
|   | MINAS                 |   |   |   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓  |   |   | ✓   | ✓   |   |   | ✓   | ✓   |   | ✓   |   | ✓   | ✓   |        |
|  | PRODUÇÃO              |   |   |   | ✓   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓  | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |   | ✓   |   | ✓   | ✓   |        |
|  | QUÍMICA               |   |   |   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓  |   |   | ✓   | ✓   |   |   | ✓   | ✓   |   | ✓   |   | ✓   | ✓   |        |
|  | SISTEMAS              |   |   | ✓   |   |   |   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓  | ✓   |   | ✓   | ✓   |   | ✓   | ✓   | ✓   |   | ✓   |   | ✓   | ✓   |        |

# UFMG Engineering Majors











# A BIG step...

**ENG  
200**



## GRAND CHALLENGES FOR ENGINEERING

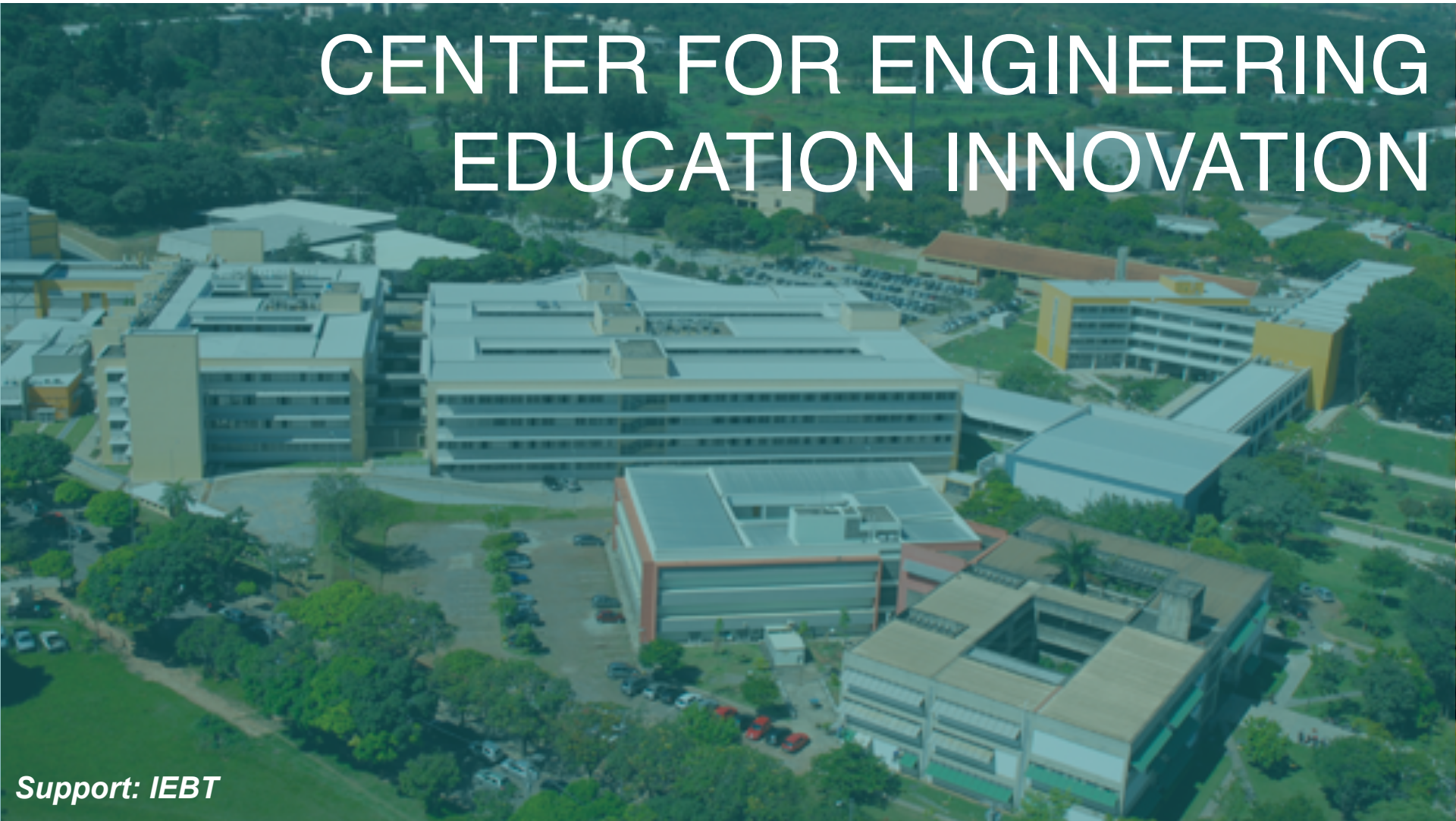
|  |   |  |
|--|---|--|
|  <p>Make solar energy economical</p>    |  <p>Provide energy from fusion</p>                   |  <p>Develop carbon sequestration methods</p>          |
|  <p>Manage the nitrogen cycle</p>      |  <p>Provide access to clean water</p>               |  <p>Restore and improve urban infrastructure</p>     |
|  <p>Advance health informatics</p>    |  <p>Engineer better medicines</p>                  |  <p>Reverse-engineer the brain</p>                  |
|  <p>Prevent nuclear terror</p>        |  <p>Secure cyberspace</p>                          |  <p>Enhance virtual reality</p>                     |
|  <p>Advance personalized learning</p> |  <p>Engineer the tools of scientific discovery</p> |  <p><b>GRAND CHALLENGES<br/>FOR ENGINEERING</b></p> |

**Engineering Education Center**



# **CRIEE**

## **CENTER FOR ENGINEERING EDUCATION INNOVATION**



*Support: IEBT*



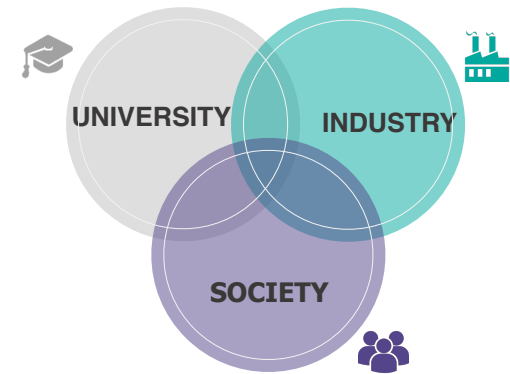
# CRIEE main goals

TO SUPPORT, TO RESEARCH and TO ARTICULATE new teaching methodologies and best practices.

To encourage the development of students' *shift skills* through the strengthening of activities related to ENTREPRENEURSHIP and technological INNOVATION.

To promote PROJECTS and ACADEMIC ACTIVITIES to train students with REAL WORLD challenges and opportunities.

# What do we expect to...



- Innovation and improvement of engineering education
- More effective absorption of knowledge
- Student empowerment (technical and shift skills)
- Promotion and dissemination of entrepreneurship and innovation
- Decreased student dropout and retention
- Attraction of more talented students

EEUFMG



- Economic and social development
- Improvement in quality of life
- Greater access to the productive sector for the students
- Training of professionals aware of their role in society
- Encouraging the emergence of similar initiatives
- Attraction and opening of new companies

SOCIETY



- Alignment between education and the productive sector
- Improvement in the technical quality of companies
- Access to a more qualified labor skills
- Development of new products and services
- Increased business competitiveness

INDUSTRY



# Our challenges...



Teaching  
methodology  
center



*Minors* in entrepreneurship and  
innovation



Fab e Tech Labs  
(space makers)



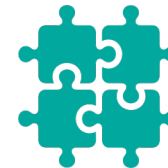
Real world problems  
solution



*Bootcamps*

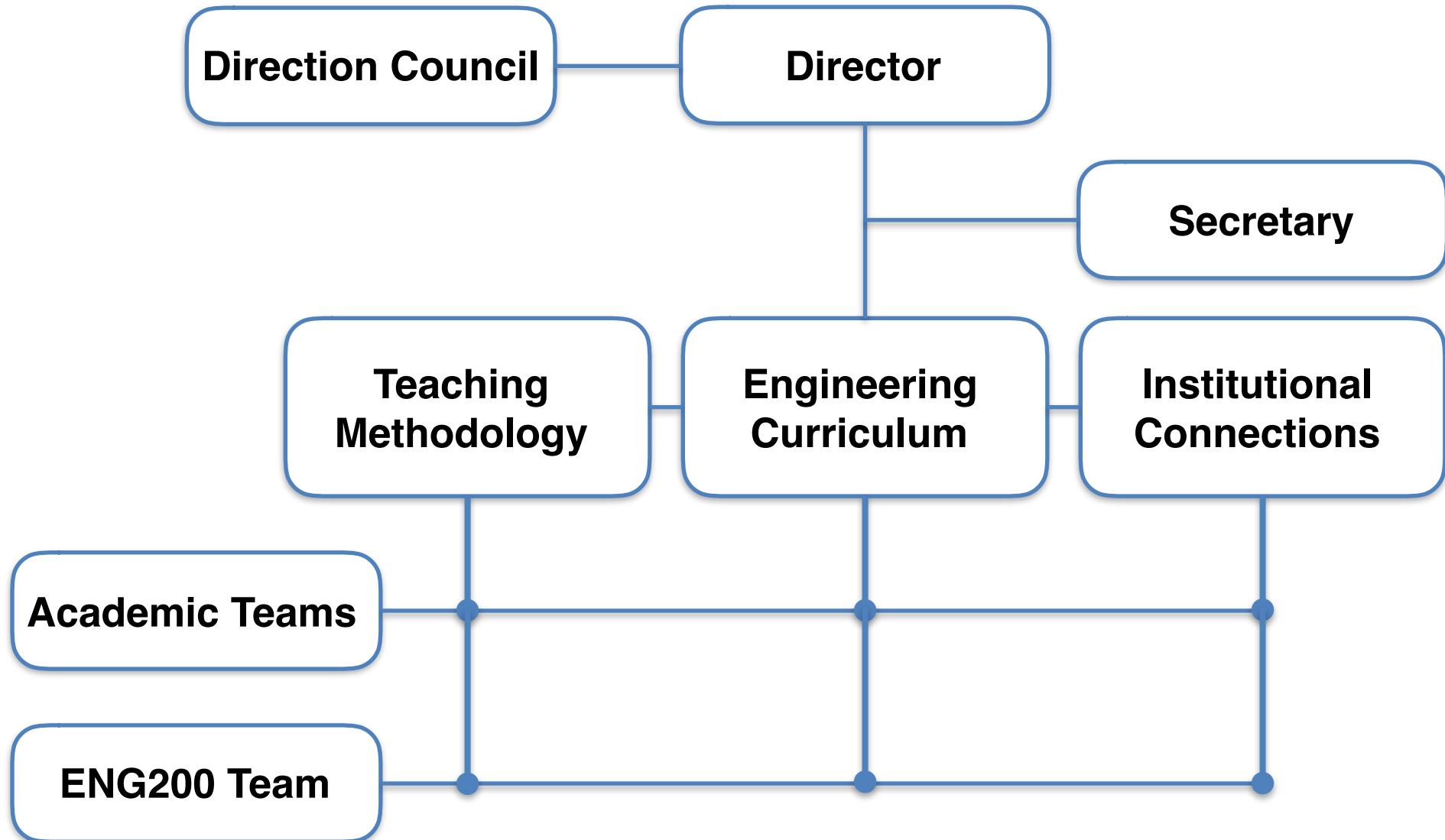


Entrepreneurship Center

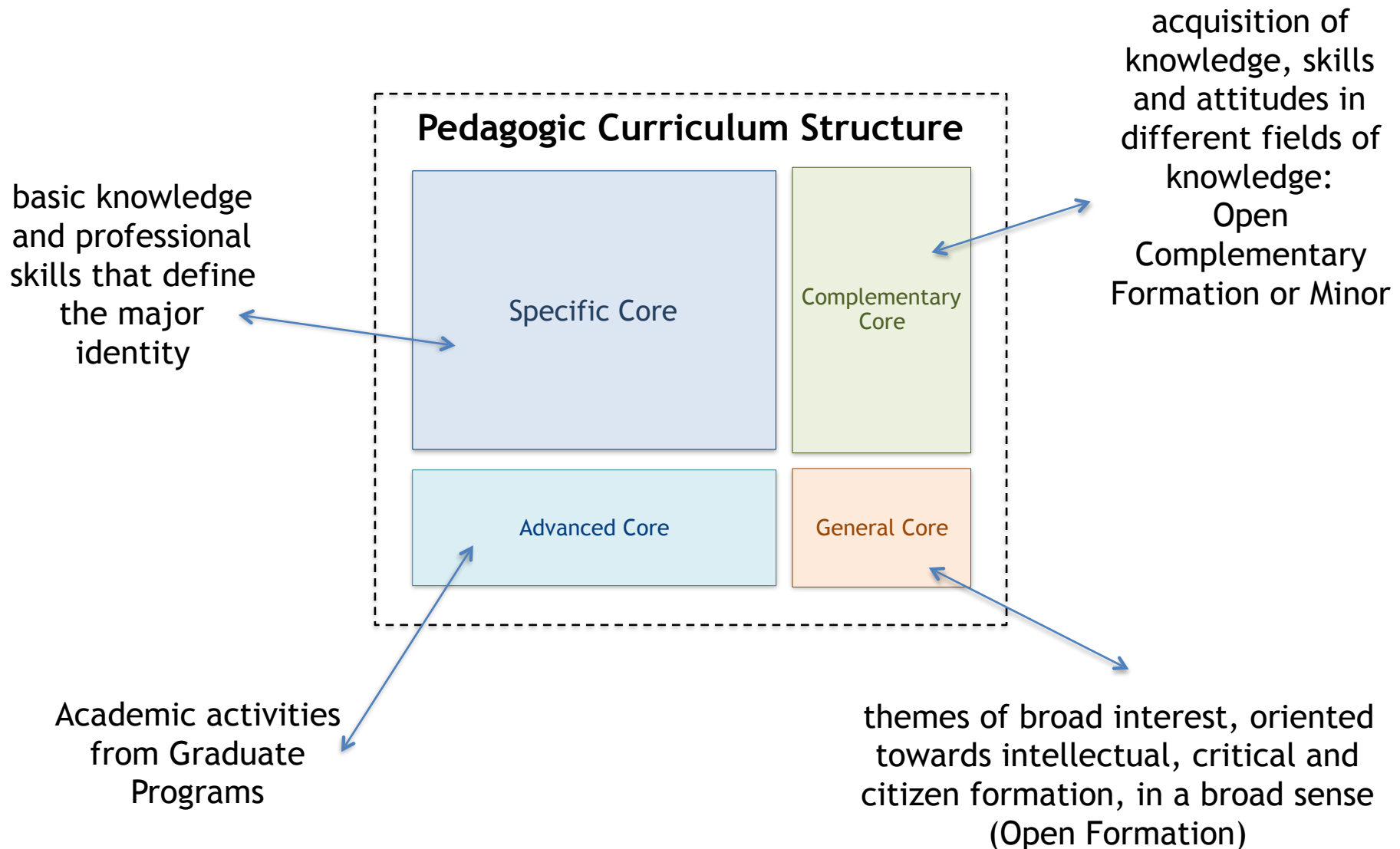


Interdisciplinary courses

# CRIEE Infrastructure



# Key Strategy: UFMG New Curriculum Rules



# ENG 200

[eng200.eng.ufmg.br](http://eng200.eng.ufmg.br)

<https://www.facebook.com/engduzentos/>  
[eng200@eng.ufmg.br](mailto:eng200@eng.ufmg.br)

Questão 2

a) Eq. Geral dos Pólos

$$T_m = \frac{J R_2}{k^2}$$

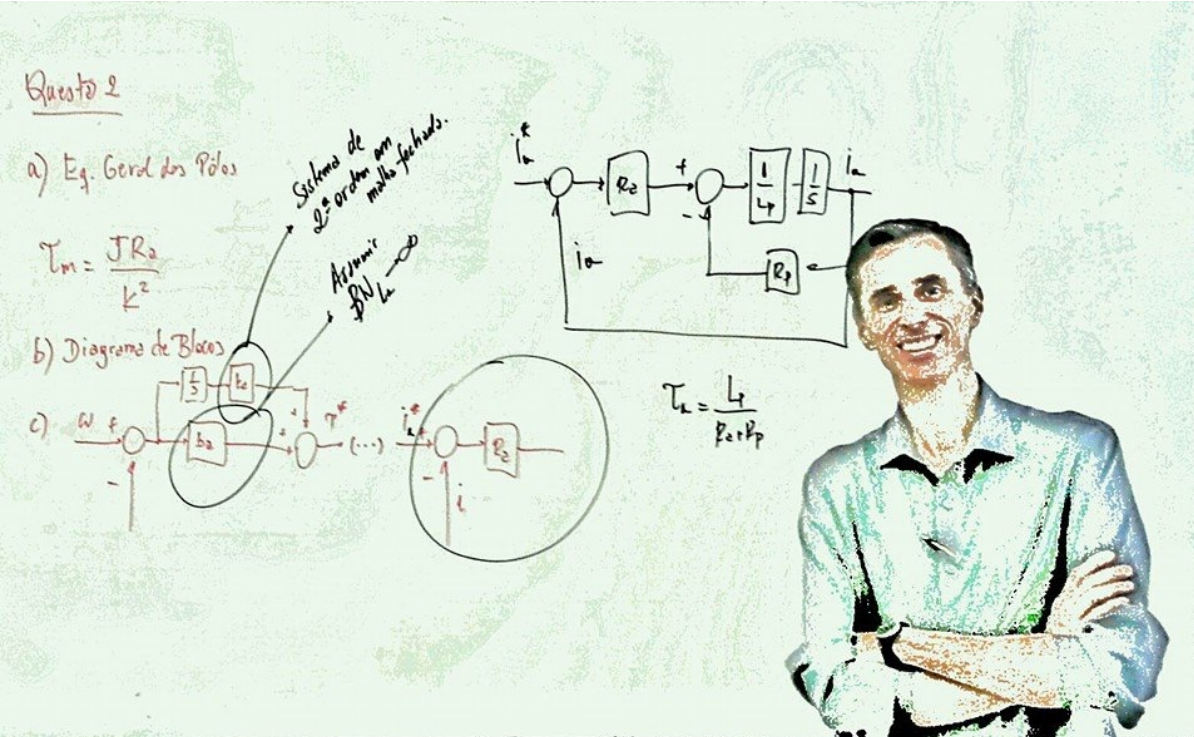
b) Diagrama de Blocos

c)

Sistema de 2º ordem em malha fechada.

Assumi  $R_N \ll L_n$

$T_n = \frac{L_f}{R_e + R_p}$



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