Computer and Electrical Engineering Graduate Studies Program (PPGEEC) at EMC/UFG

1. Introduction

The Graduate Studies Program (PPGEEC) at EMC/UFG mission is to contribute towards the transformation of society through the excellence training of its candidates, enabling them to innovate through research, create using technological development and share knowledge by teaching.

In line with that mission, the graduating professional shall:
a) be able to conduct research, promote the development and create innovation in the fields of Computer and Electrical Engineering;
b) have a sound theoretical foundation allied with capacity for sharp critical analysis and keen ability to single out regional technological demands/;
c) be at home in academic, commercial and industrial settings.

2. Goals

PPGEEC's main goal is to train researchers and professionals in the fields of Electrical-electronic Systems, Intelligent Systems and Applied Computing, developing their abilities to independently pursue research, teaching and development work, with an interdisciplinary approach and from multi-referential viewpoints.

3. Specific Goals

a) Encouraging research and knowledge creation in the fields of Systems and Computer Engineering;
b) Nurture the development of researchers, that focus on: the investigation of relevant issues in the above fields, the increase of quality of life and environmentally sound practices;
c) The graduating professional shall possess the relevant knowledge and skillset in one of the two offered fields of study, with special focus on the expertise required in one of the research topics in that field.

The graduate candidate will be required to have made advances in the state-of-the-art of the chosen field of research. The candidate should be aware that their work should be relevant to current social demands. Towards that latter end, the Graduate Studies Program will offer research and teaching opportunities that encourage the candidates to branch out from their research, innovative solutions to challenges in the productive sectors.

The graduating professional shall be capable of defining, analyzing, designing, coordinating and executing systems and projects that are creative, adaptive and effective. These projects/systems should use digital or computational systems, applied to topics, e.g. biological system interfaces, that require multidisciplinary knowledge and skills.
The graduating professional shall also be able to work in and lead multidisciplinary teams.

Possible applications include interfaces, novel adaptive applications and computer methods, signal processing, teleprocessing applications, computer applications and technological innovation.

4. Selection Process and Required Documents

Information regarding the required documents and the candidate selection process at the EMC/UFG Programa de Pós-Graduação em Engenharia Elétrica e de Computação (PPGEEC) may be found at the site: https://ppgeec.emc.ufg.br/

5. Team (02/2020 - 01/2022 term)

- **Coordinator:** Prof. Dr. Flávio Henrique Teles Vieira
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  . Daiane Cristina Pereira Dionizio
  . João Antônio dos Reis

6. Research fields
a) Field 1: Electrical-electronic Systems (SEE)
    This field encompasses:
- Mathematical modelling, computation simulation, property characterization and study of dielectric, magnetic and semiconductor materials
- Electrical component, equipment and device design optimization and testing;
- Power System Operation Optimization, Modern and Adaptive Control;
- Distributed Power Generation Systems, Photovoltaic Power Systems;
- Signal and Image Processing
- Mobile Cellular Communication, Wireless Networks, Packet Communications.

b) Field 2: Applied Computing and Intelligent Systems
    This field encompasses:
- Complex Task Solving Semiautonomous and adaptive Systems;
- Computer and Electrical Engineering Optimization
- Device and System Modelling and Simulation;
- Computer and Electrical Engineering applications of Machine Learning and Artificial Intelligence.

c) Field 3: Biomedical Signals and Systems
    This field encompasses:
- Biomedical signal and image processing;

- Biomedical Systems, Materials and Instrumentation;
- Biomechanical and Neuroscience modelling and simulation.

7. Courses

Course	Credits
Machine Learning	4
Fuzzy and Flexible Computing	4
Digital Communications	4
Modern Heuristics	4
Artificial Intelligence	4
Scientific Research Methodology	4
Electrical Machines Modelling	4
Finite Element Methods for Electrical Engineering	4
Biomechanical movement analysis	4
Methods of Linear Analysis	4
Neurofisiology - Mathematical Methods	4
Electrical Power Systems Planning	4
Signal Processing I	4
Signal Processing II	4
Biological Signals Processing	4
Stochastic Processes	4
Linear Programming	4
Non-linear Programming	4
Qualification Seminars	4
Topics in Electrical-electronic Systems	4
Topics in Intelligent Systems and Applied Computing	4
Topics in Biomedical Signals and Systems	4

8. Professors

The professors involved with the graduate studies program are given in Table 1.

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9. Laboratories

The Graduate studies program at EMC/UFG relies upon several laboratories, which have received recent funding from large R&D programs, (ANEEL, MCT, FINEP, FAPEG, FUNAPE) as well as from smaller federal and state government supported regional programs.

The Graduate studies program continually seeks to support current and future research groups and laboratories aligned with the program's research fields.

a) Laboratory: INCOMM

The Communications Research Group (INCOMM) melds academic research and state-of-the-art technology development with support from its team of PhD's, MSc's, graduate and undergraduate students. INCOMM currently has a Simulation Laboratory with 20 seats/workstations, 8 computers, one scanner-laser printer, a meeting room, wireless and wired Internet access as well as air conditioning. In 2004, INCOMM opened a FINEP (Edital CT-INFRA/Institucional 04/2003) and FUNAPE funded Multimedia Engineering Laboratory (ENGEMULTI), offering multimedia equipment and visual collaboration tools.

b) Laboratories: NEPE

The Center for Energy and Planning Studies (NEPE) has as goals the study, research and development of heuristic and/or optimization algorithms that facilitate decision-making on strategic, operational and tactical levels. The group has a multidisciplinary nature and leverages its member's hands-on knowledge in fields as diverse as Operational Research, Intelligent Systems, Game Theory, Economics Engineering, Power Systems. NEPE has three computer laboratories: NEPE-1, with an HP server and six Core i7 desktops, and NEPE-2, with another HP server and 10 Core i7 desktops, and the "Prof. Alcir Monticelli" lab, with a Dell server and workstations. Most of the computational resources was acquired with funding from companies in the Electrical Power Systems field (CELG-ENEL, CEB, Eletronorte), associated with R&D projects developed since 2001.

c) Laboratories: PEQ

The Center for Research and Studies in Energy Processing and Quality (PEQ) assimilates, develops and shares scientific and technological knowledge in the following fields: Electrical Machines and Power Devices; Industrial Electronics, Electronic Systems and Controls, Magnetic Materials and Devices, Electrical, Magnetic and Electronic Measurements, Instrumentation, Co-generation, Power Regulation, Power Quality. PEQ currently has several top-of-the-line laboratories, funded by Power Systems companies (CELG-ENEL, CHESP) and R&D funding agencies (CNPq, FINEP). PEQ has been going strong since 2001.

d) Special Machines Lab

Involved in basic and advanced research and development, targeting novel electrical motors, and associated control systems, and equipment and devices used by renewable energy power sources.

e) Electrical Components and Materials Lab (LAMCE)

An air-conditioned 85 square meter lab offering 12 workbenches and supporting data and power infrarastructure. Equipment available include power sources, power amplifiers, function generators, thermal camera, oscilloscopes, data acquisition units/systems, VA-Watt meters, impedance analyzers (including permissivity and permeability), Epstein device, transducers, differential voltage tips, GPIB AND DAQ boards, licensed specialized computer programs and

computers. All the equipment are computer controllable through a GPIB interface. LAMCE also has an Industrial Automation Lab, founded in 2001, with the support of WEG (donation of equipment and personnel training), under the *Lei da Informatica* funding program. Last but not least, LAMCE has the top-of-the-line Transformer Testing Lab, founded in 2004.

f) Biomechanics and Bioengineering Lab

This lab offers highly specialized equipment, such as a Motion Capture system (Natural PointOptitrack), ARENA Motion Capture software, C-Motion's Visua3D kinematics analysis software, dinamometrics system composed of two AMTI OR6 force platforms, a electromiography system (16 channel signal conditioners, 100x amplifiers, 20-500 Hz band-pass analog filters, 16 bit 16 channel ADC board, AQDados software, an electrocardiograph, a 4 channel 60 MHz color screen oscilloscope, a MINIPA multimeter, a 32 channel 16 bit National Instruments ADC board, a CORRENTE RUSSA electrostimulation equipment, a Tens/Fens electrostimulation equipment, as well as a server and 12 computers and an extensive library with more than 200 books and journal access.

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Translation: Prof. Marco Antonio Assfalk de Oliveira (2021)
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