DR. BULENT SARLIOGLU

Associate Professor
Department of Electrical and Computer Engineering
Department of Mechanical Engineering
Department of Engineering Professional Development
Associate Director
Wisconsin Electric Machine and Power Electronics Consortium (WEMPEC)

College of Engineering, University of Wisconsin-Madison
807 Extension Building, 432 N. Lake Street, Madison, WI 53706
Phone: 608.262.2703, Fax: 608.263.3160,
bulent@engr.wisc.edu

PROFESSIONAL PREPARATION

Ph.D University of Wisconsin-Madison, Electrical and Computer Engineering, 1999
Madison, Wisconsin, USA
Advisor: Dr. Thomas A. Lipo

MS University of Missouri-Columbia, Electrical and Computer Engineering, 1992
Columbia, Missouri, USA
Advisor: Dr. Richard G. Hoft

BS Istanbul Technical University, Honor Student, 1990
Istanbul, Turkey

APPOINTMENTS

Associate Professor, University of Wisconsin-Madison	2017-Present
Assistant Professor, University of Wisconsin-Madison	2011-2017
Associate Director of WEMPEC, University of Wisconsin-Madison	2011-Present
Staff Systems Engineer, Honeywell Aerospace, Torrance, California	2007-2011
Principal Engineer, Honeywell Aerospace, Torrance, California	2000-2007
Sr. Research and Development Eng., Toshiba Int., Houston, Texas	1998-2000
Research Assistant, University of Wisconsin-Madison	1992-1998
Summer Intern, Allied Signal Aerospace, Torrance, California	1997
Teaching Assistant, University of Wisconsin-Madison	1996-1998
Research Assistant, University of Missouri-Columbia	1992

AWARDS

- Inventor or co-inventor of 18 U.S. patent awards and 2 additional US patents are pending
- Honeywell Aerospace Outstanding Engineer Award, 2011
- Honeywell Aerospace Technical Achievement Award, 2002
- Gerald Holdridge Teaching Excellence Award, Department of Electrical and Computer Engineering, University of Wisconsin-Madison, Spring, 1998
- NSF CAREER AWARD 2016-2021

SYNERGISTIC ACTIVITIES

Program Director, UW-Madison Continuing Engineering Education. New courses developed and he teaches: 1. Introduction to Energy Storage Devices and Systems 2. Introduction to EMI/EMC and Best Practices. 3. AC Machine Design Fundamentals 4. PM Machine Boot Camp 5. Power Electronics Design Boot camp 6. High Speed Machines and Drives

Also directs and teaches at 1. Dynamics and Control of AC Drives and 2. Permanent Magnet Machines and Drives

List of the lecture topics with the titles and short abstracts

1. **Design of Permanent Magnet Machines**

This course reviews various types of PM machines and goes through the fundamental design considerations and guidelines. PM machines are becoming more important in many applications because of higher efficiency and lower weight and volume. Thanks to development of the permanent magnet (PM) material over the past few decades, very high power density (more than 10 kW/L) could be achieved for PM machines. Different types of PM machine have been studied and used in academies and industries such as interior PM machine, surface PM machine and flux-switching PM machine. Even though the PM machines have many advantages, there are many challenges that need to be considered, including the losses in core and PM, selection of winding topology and manufacturing. For high quality PM machine design, special considerations should be taken to overcome these challenges.

2. **Design of Flux Switching PM Machines:**

Flux switching PM machines are attracting attention because of its simplicity and high efficiency. Because rotor does not have any windings and PMs, these machines can be considered for high speeds and high efficiency applications. Challenges of FSPM machine include high fundamental frequency high volume of permanent magnet material. Low-pole FSPM machine with special design is a potential solution. With the advent of SiC and GaN based inverters, FSPM machine will become more viable for many applications including transportation applications.

3. **Wide Bandgap Based Power Electronics**:

SiC and GaN devices offer low on-state losses and lower switching losses. These devices can be switched faster than IGBTs because they are MOSFETs. The MOSFET nature of these new devices for high voltage applications open the door for high switching frequency. This allows minimization of filter elements for differential mode. The tutorial covers the definition of these new devices, characterization, gate drive design considerations, efficiency calculations and EMI/EMC concerns. The tutorial shows key design examples.

4. **Common Mode Emissions in Motor Drives and Mitigation Techniques:**

Common mode emissions are very important for motor drives because of conducted and radiated emissions and potential bearing current and damage. Common mode emissions are increased because of increased speed of

5. **More Electric Aircraft:**

Nowadays electric vehicles are attracting much attention. Being also a common transportation facility, the electrification of aircraft is also becoming an important topic. In this tutorial, Dr. Sarlioglu gives a review on the current and future trends of the electrification of commercial aircraft. In the first part, benefits of electrification are presented as well as the research motivation. Secondly, the status of electrifications in the commercial aircraft including power system, main engine start (MES), and environmental control system (ECS)

is presented. Next, future trends of more electric aircraft (MEA) are introduced, e.g., electric taxi, hybrid electric propulsion or even full electric aircraft. Innovative concept like solar airplane and flying cars is also introduced. Lastly, the enabling technologies for MEA are introduced such as the high efficiency power electronics, high-speed electric machines, and energy storage technologies.