



NSF-Sponsored ECE Department Heads and Faculty **Online** Workshop

Dissemination of Electric “Power” Courses/Laboratories Developed through ONR Funding

Monday, March 8, 2021

Workshop Objectives:

This workshop will discuss a three-prong approach as follows:

1. Create a Pipeline of High School Graduates into the ECE programs:

Discuss two courses that can be taught by the ECE departments in all universities and promoted in high schools to convey the awareness of climate emergency and ways to implement solutions. Given that many solutions are ECE-oriented, tailoring these courses can become a pipeline to electrical engineering programs in which enrollments are declining nationwide.

2. Facilitate Teaching of Senior/Graduate-Level Courses in Power Systems, Power Electronics, and Electric Machines/Drives:

Anybody can freely download all the material for seventeen courses from our website <http://cusp.dl.umn.edu>. In keeping with a recent MIT study (“US electricity demand can be met with currently available zero-carbon technologies”), these courses form the foundation for moving toward one-hundred percent renewables that will require up to four times the existing transmission infrastructure. General Motors just announced that it would sell only vehicles that have zero tailpipe emissions by 2035. This will require knowledge of power electronics and electric machines/drives.

Are we graduating students in large numbers with first-rate education to take on these challenges?

3. Provide Hands-On Education using Extremely Low-Cost Hardware Laboratories funded by ONR:

These labs are developed to provide hands-on experience to supplement the courses mentioned above. These laboratories can also be accessed remotely and thus an entire lab can be set up for as little as 2,500 dollars. They are made available through a University of Minnesota startup.

All times are in CDT.

8:00 am – 9:00 am Welcome Session and the Importance of EE and STEM

- Prof. Randy Victora – ECE Dept Head, University of Minnesota
- Dr. Aranya Chakraborty – Program Director, National Science Foundation (NSF)
- CAPT Lynn J. Petersen USN (Ret) – Program Officer, Office of Naval Research (ONR) “Reinventing Power Programs Through Sustainability-Focused Curriculum; an Update”

9:00 am - 9:30 am Pipeline Courses

- Outline of a pipeline course being taught in several high schools, “Climate Crisis: Implementing Solutions” (<http://z.umn.edu/ee1701>) – Prof. William Robbins – University of Minnesota
- Outline of a pipeline course to ECE, “Sustainable Electricity: Renewables and Conservation” (<http://z.umn.edu/ee2701>) - Prof. Ned Mohan – University of Minnesota

- 9:30 am – 10:30 am Demonstration of ONR-funded Hardware Laboratories
- Overview of ONR-funded Development of Extremely Low-Cost Electric Machines/Drives, Power Electronics, and Power Systems Labs at UofM - Prof. Ned Mohan
 - Demonstration of these three labs – Dr. Siddharth Raju, Postdoc – UofM
- 10:30 am – 3:00 pm Discussion of Senior/Graduate-Level Courses in “Power”
- Course/Lab under development for “High Power Electronics for Utility-Integration,” - Prof. Mohan, UofM
 - First Courses in Power Electronics and Power Systems - Prof. Mohan, UofM
 - Cyber Security in Power Systems – Prof. Manimaran Govindarasu, Iowa State U
 - Advanced Course in Power Electronics – Prof. Robbins, UofM
 - Electric Machines and Drives: Basics and Vector Control - Prof. Mohan, UofM
 - Machine Design Lectures for Three Motor-Generator Types– Jim Hendershot, Motorsolver
 - Course on Power Generation, Operation and Control - Prof. Wollenberg, UofM
 - Course on Power System Protection, and Relaying – Pratap Mysore, UofM
 - Reliability of Power Systems – Prof. Chanan Singh of Texas A&M
 - Restructured Electricity Markets – Prof. Ross Baldick, University of Texas
 - Power System Quality – Prof. Surya Santoso, University of Texas

The registration is free, and the link to register is as follows: <https://www.eventbrite.com/e/ece-dept-headsfaculty-workshop-disseminate-educational-material-in-power-tickets-135737625893>