Teaching Dossier

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Teaching Responsibilities

As a course instructor, I do not have to worry about the choice of course materials or laboratory content. All I can do is do my best to fulfill my duties and help students achieve their goals. Along the way, I kept learning and improving. Table I lists all the courses I have taught as a lecturer or tutored as a TA.

Table I: Courses I've Taught or Tutored

Course No.	Class Size	Course Title	Session	Role
ENGR 210	92	Engineering Mechanics, Statics	Fall, 2018	Visiting
ENGR 220	143	Engineering Mechanics, Dynamics	Fall, 2018	Scholar
CNTR2351	32	Programmable Logic Controllers	Fall, 2010	Lecturer
ELEC1181	32	Electrical Fundamentals	Fall, 2010	Lecturer
ELEC2433	32	Rotating Electrical Machines II	Fall, 2010	Lecturer
ELEC2461	32	Protective Relaying	Fall, 2010	Lecturer
DIGI 210	35	Digital Fundamentals	Fall, 1997	Lecturer
INST 101	35	Basic Instrumentation	Fall, 1997	Lecturer
ECE 360	33	Control Systems I	Fall, 1995	TA
EE 343.3	34	Power Electronics	Fall, 1993	TA

Two courses at Soochow University:

- Engineering Mechanics, Statics (ENGR 210) [3 credits]
  This course in engineering mechanics addresses the addition and resolution of forces, vector algebra, graphical methods, equilibrium, free body diagrams, trusses, frames, friction, centroids and moments of inertia, and fluid statics. PREREQ: MATH 170 and PHYS 211.

- Engineering Mechanics, Dynamics (ENGR 220) [3 credits]
  This course in engineering mechanics covers particle and rigid body kinematics and kinetics, work/energy, impulse/momentum concepts, and combined scalar/vector approach.
  PREREQ: ENGR 210.

Four courses at Northern Alberta Institute of Technology:

- Electrical Fundamentals (ELEC1181) (6 credits)
  This course begins with the fundamentals of DC voltage, current, and resistance. It will also look at Ohm's law and Kirchhoff's laws and their applications for series and parallel circuits, resistance networks, and circuit reduction theorems. Other topics include energy and power, capacitance, and the use of measuring instruments. The course then covers magnetism, magnetic circuits, electromagnetism, and single-phase AC. It will also discuss the fundamentals of inductance, reactance, impedance, and admittance. Resonance in series and parallel AC circuits will be discussed as well as impedance networks, energy, power, power factor, and power factor improvement. Phasor diagrams and power quality instruments will be used throughout the course to corroborate experimental data with theoretical calculations. Laboratory exercises reinforce the theory.

- Programmable Logic Controllers (CNTR2351) (3 credits]
  This course focuses on alternative PLC programming languages, PLC data communications, interconnecting analog/digital field devices, and Human Machine Interfaces (HMI) in automated processes. The programming languages covered include Ladder Diagram (LD), sequential function chart (SFC), Function Block Diagram (FBD), and Structured Text (ST). The basic setup, configuration, and design of HMIs are discussed and performed.

- Rotating Electrical Machines II (ELEC2433) (3 credits)
  A study of the construction, the theory of operation, control, and performance characteristics of synchronous motors and generators. Topics include synchronous speed, torque, the power developed, losses, efficiency, parallel operation and voltage regulation of alternators, synchronous motors starting methods, excitation characteristics, load and torque angle tests, and power factor improvement. Laboratory exercises will be performed by the students to reinforce the theory.

- Protective Relaying (ELEC2461) (6 credits)
  Topics covered in this course will include operating principles and applications of protective relays, such as relay coordination, transformer protection, motor protection, and transmission line protection. Students will determine settings for various relay functions and ensure proper coordination using manual or software-aided techniques. Students will also test multiple relays and functions to industry standards, such as overcurrent, directional overcurrent, differential, motor protection, voltage, and impedance relays. Students will become familiar with single and three-phase test sets, and understand the basic mechanisms of Ethernet communication in protection and control. Completion of test documentation in a written report is required.

Two courses taught at Southern Alberta Institute of Technology:

- Digital Fundamentals (DIGI 210) (3 credits)
  Digital Fundamentals will provide learners with a foundation of digital logic concepts. Learners will develop skills in designing, building, implementing, and troubleshooting basic digital logic circuits. Theory and lab will be supported through the use of simulation software. This course will prepare the learner for the Digital Design and Applications course.

- Basic Instrumentation (INST 101) (Non-credit)
  Basic Instrumentation is undertaken to provide the learner with the knowledge and understanding of Basic Instrumentation principles. The Objectives cover Basic Electrical, Digital Basics, Tubing, Filling & Flaring, Cable and wire termination, and Instrument drawings and documentation.

One course at the University of Alberta:

- Control Systems I (ECE 360) (3 credits)
  Linear system models. Time response and stability. Block diagrams and signal flow graphs. Feedback control system characteristics. Dynamic compensation. Root locus analysis and design. Frequency response analysis and design.

One course at the University of Saskatchewan:

- Power Electronics (EE 343.3) (3 credits)
  This course discusses the fundamental concepts and introduces the essentials of analyses and design of power electronic circuits. Topics include power electronics devices, switching losses, analyses and design of single-phase ac-dc converters, analyses and design of three-phase ac-dc converters, analyses and design of dc-dc converters, analyses and design of single- and three-phase dc-ac converters.

Statement of Teaching Philosophy

Beliefs: My teaching experience has helped me realize that motivation plays a critical role in learning success. I believe that students learn best when they recognize that learning will change themselves at the level of knowledge, attitude, or behavior, thus motivating them internally. Their views of ideas, concepts, and society will change.

Students may not comprehend that learning the content of textbooks is only part of higher education. We should incorporate critical thinking, communication, and problem-solving into the daily curriculum, making students subconsciously look for opportunities to learn intellectual, physical, and professional skills.

I also found that when students receive timely feedback and have a chance to correct their mistakes to improve learning outcomes, they are more likely to make an extra effort to do so. The tradition was that students would receive their scores and feedback if any a week or longer after summiting. By then, they probably forgot what they did. Today, we could and should supply feedback instantly.

Strategies: Motivation is complicated because a student's attitude to learning is affected by combined psychological, physical, educational, and social factors.

- *Accountable Talk* requires students to acquire content material. It also provides opportunities to practice presenting and communicating skills;
- *Project-Based Learning* promotes creative thinking. It is a fun and motivating strategy in which students will learn and enhance skills in the subject matter in creating and implementing their projects.

Depending on the class size and topics of the course, I employ various content delivery methods to engage students. I use a combination of demonstration, Q&A, discussion, and brainstorm for 3rd and 4th year engineering students. I found this was harder to implement in large classes. Fortunately, I could utilize an Instant Message APP (QQ) to interact with students. Dividing students into groups and communicating by group: talking, videoing, conferencing, screen sharing, sending/receiving docs are instant ways of getting feedback.

Teaching Methodologies and Materials

As a course lecturer, I cannot change the teaching strategy based on the research results, but use the traditional teaching strategy that was used by the college or university. I just infiltrated some elements of my teaching beliefs.

For example, when teaching a course in mechanics, I introduced some large-scale mechanical projects in China to the students to motivate them. I will use formative assessment from time to time to fine-tune the areas where students are lagging. Students can put more effort into weak areas and improve.

I help students change their learning behavior from passive to active, instead of worrying about failing to pass a course but thinking about what they can learn and how the knowledge they learn plays a key role in their professional life. In this way, they adopt deep learning methods to make the course a success.

Teaching materials are plentiful. Not all textbooks are suitable for a specific course in a college, especially in the third and fourth years of engineering studies. Therefore, specific textbooks may not be mandatory in practice.

I found that a carefully designed syllabus for a specific course, supplemented with effective evaluation strategies, is a winning strategy for enhancing teaching and learning. The professors will arrange materials according to the syllabus.

Professional Learning and Development

Teaching professionals need continuous learning and development. Today, the pace of innovation is rapid. I envy those who teach classical literature. In electronics and information technology, one must keep learning new things. Fortunately, this happens to be something I enjoy doing.

As the learning environment changes, we must also adapt to alternative teaching methods. For example, the COVID-19 pandemic forced us to teach online, which limits our communication efficiency.

To impart knowledge to students is a complicated process. Since we do not have time to conduct deep research on this subject ourselves, engineering professors need to keep abreast of the latest research results in teaching through literature and publications.

Fortunately, education professionals have been generous. They provided us with the results of their research. Here are some resources that introduced me to areas that may play a role in my future endeavors as an educator.

Taylor Institute for Teaching and Learning | University of Calgary

The Institute provides Courses and Workshops, Programs, and series and Events for Academic Staff, Graduate Students, and Postdoctoral Scholars. I took their Teaching Dossiers development course and it was very helpful.

Center for Teaching and Learning | Queen's University

This Center provides comprehensive teaching support for higher education. I took their six-module course: Teaching and Learning in Higher Education Six Modules

Courses to Teach

Undergraduate: as assigned
Graduate: as assigned

Other Courses on:
Programming in C/C++
Java (SE and EE)
Python
Apache Hadoop (MR and HDFS)
Pig and Hive Programming Framework
Machine Learning with Big Data
NoSQL Databases
Apache Spark (Python/Java)

Publications

After graduation, I worked in industry. I had no opportunity to publish papers, only two *IEEE Conference* articles.

Williams, B.; Ao, S., Oracle Utilities, Oracle Corp., Redwood City, CA, USA, "Advanced Distribution Management Can Bridge the Chasm on the Road to Grid Modernization", CICED, 5th International Conference on Distribution, September 5-6, 2012, SHANGHAI

Williams, B.; Ao, S., Oracle Utilities, Oracle Corp., Redwood City, CA, USA, "Distributed Systems to Optimize Power Distribution and Support Microgrids", CICED, 5th International Conference on Distribution, September 5-6, 2012, SHANGHAI

Before graduation, I published four peer-viewed papers on *IEEE Transactions*, and one *Canadian Electrical and Computer Engineering Conference* paper in graduate school.

S. Z. Ao, T. S. Sidhu and R. J. Fleming, "Stability Investigation of a Longitudinal Power System and Its Stabilization", ***IEEE Trans. On Energy Conversion*** *vol. 9, no.3, September 1994, pp. 466-474.*

S. Z. Ao, K. E. Bollinger, "Adaptive Control of a Synchronous Generator", Canadian Conference on Electrical and Computer Engineering, May 26-29, 1996, Calgary, Canada. The paper is published in the Conference proceedings, pp. 582-585.

T. S. Sidhu, S. Z. Ao, "Online Evaluation of Capacity and Energy Losses in Power Transmission Systems", ***IEEE Trans. On Power Delivery****, Vol. 10, No. 4, October 1995, pp.1913-1919. (Financed by T. S. Sidhu)*

K. E. Bollinger, S. Z. Ao, "PSS Performance as Affected by Its Output Limiter", ***IEEE Trans. On Energy Conversion*** *vol. 11, no. 1, March 1996, pp. 118-124. (Project financed by K. E. Bollinger)*

S. Z. Ao, R. J. Fleming and T. S. Sidhu, "A Transient Stability Simulation Package (TSSP)", ***IEEE Trans. on Power Systems*** *vol. 10, no. 1, February 1995, pp. 11-17.*

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