Course name	**ECE 42700 Power Electronics**
Credit and contact hours	(3 cr.) Class 3
Course coordinator's name	Euzeli dos Santos
Textbook	A Hundred Solved Problems in Power Electronics ISBN# 9781508450139, Euzeli C. dos Santos Jr., Gregory Carlos , 2015.
Course information	**2020-21 IUPUI Campus Bulletin description:** ECE 42700 Power Electronics (3 cr.) P: ECE 25500. Class 3. Introduction to the fundamental operating principles of power conditioning circuits that are currently being used to effect power flow from ac to dc and vice versa. Emphasis is on the relationship between form and function of these circuits. Circuits discussed will include ac/dc line-commutated converters, dc/dc converters, dc/variable frequency converters, resonant converters and ac/ac converts. Computer simulations will be used as part of the course work. **Prerequisites/ Co-Requisite** ECE 25500 or equivalent **Required, Elective, or Selected Elective:** EE Elective, CE Elective
Goals for the course	Upon successful completion of the course, students should be able to 1. An understanding of the relationships between form and function and the roles played by various circuit components in ac/dc, dc/dc, and dc/ac converters. [1, 4;1, 2, 6] 2. Knowledge of the basic characteristics of switch types, and classification of converters. [1, 3;1, 1, 2,6] 3. Knowledge of control and switching techniques, and operating principles of ac/dc, dc/dc, and dc/ac converters. [1, 4;1, 2,6] 4. Knowledge of the methods of sizing the switching and energy storage elements in ac/dc, dc/dc, and dc/ac converters. [1, 4;1, 2, 6]
List of topics to be covered	1. Introduction to the fields of application 2. Characterization of switch types and classification of inverters 3. Ac/dc line-commutated converters: - time domain analysis of a half-wave rectifier circuit, current commutation, measures and effects of distortion (2) - bridge and polyphase rectifier circuits (3) - phase control, rectifier and inverter operations (3) 4. Dc/dc converters: - topologies, basic switch arrangement, converter connections with and without direct dc path, step-down and step-up converters, ripple frequency

	model, sizing of the L's and C's, device stresses (6) - transformer coupling for isolation and level change: single- and double-ended isolated converters, flyback converter, effect of leakage inductance (4) 5. Dc/variable frequency ac converters: - voltage- and current-source inverters, harmonic reduction, pulse width modulation, transformer-coupled converters, three-phase converters 6. Resonant converters: - voltage-source series converters, modified topologies dc/dc converters 7. Practical considerations: - gate and base drives to transistors and thyristors, types of commutation circuits, snubbing, thermal considerations (1) - Magnetics: design of inductors and transformers (3) - filtering requirements (4) - laboratory demonstrations (2)
Syllabi approved by	Euzeli dos Santos
Date of approval	12/03/2021