Washington State University
MAJOR CURRICULAR CHANGE FORM - - NEW/RESTORE COURSE

- ☐ **Please attach rationale for your request, a complete syllabus**, and explain how this impacts other units in Pullman and other campuses (if applicable).
- ☐ **Obtain all required signatures with dates.**
- ☐ **Provide original stapled packet of signed form/rationale statement/syllabus** PLUS **10 stapled copies** of complete packet to the **Registrar's Office**, campus mail code 1035.
- ☐ **Submit one electronic copy of complete packet** to wsu.curriculum@wsu.edu.

Requested **Future** Effective Date: Fall 2016 (term/year) Course Typically Offered: Spring

DEADLINES: For fall term effective date: **October 1st**; for spring or summer term effective date: **February 1st**. See instructions.

NOTE: Items received after deadlines may be put to the back of the line or forwarded to the following year. Please submit on time.

☒ **New Course** ☐ Temporary Course ☐ **Restore Course**

ECE	565	Power System Stability and Control
course subject/crosslist	course no.	title

3	(3	- 0)	ECE 411
Credit hrs	lecture hrs per week	lab or studio hrs per week	prerequisite

Description for catalog: General background and overview of power system stability: angle and voltage stability, transient and long-term stability, methods for improving stability

Additional Attributes: Check all that apply.

☐ Crosslisting (between WSU departments)* ☐ Conjoint listing (400/500):_____

☐ Variable credit:_____ ☐ Repeat credit (cum. max. hrs):_____

Special Grading: ☐ S, F; ☐ A, S, F (PEACT only); ☐ S, M, F (VET MED only); ☐ H, S, F (PHARMACY, PHARDSCI only)

☐ Cooperative with UI ☐ Other (please list request): _____

The following items require prior submission to other committees/depts. (SEE INSTRUCTIONS.)

☐ Request to meet Writing in the Major [M] requirement **(Must have All-University Writing Committee Approval.)**

☐ Request to meet UCORE in _____ **(Must have UCORE Committee Approval › › See instructions.)**

☐ Special Course Fee_____ **(Must submit request to University Receivables.)**

Contact: John Lynch Phone number: (360) 546-9252 Campus mail code: VECS

Email: jdlynch@wsu.edu Instructor, if different:_____

8/28/15	8/31/15	
Chair/date	**Dean/date**	**All-University Writing Com / date**
Chair (if crosslisted/interdisciplinary)*	**Dean (if crosslisted/interdisciplinary)***	**UCORE Committee Approval Date**
Catalog Subcommittee Approval Date	**GSC or AAC Approval Date**	**Faculty Senate Approval Date**

***If the proposed change impacts or involves collaboration with other units, use the additional signature lines provided for each impacted unit and college.**

Rationale: 565 Power System Stability and Control
Power delivered to end users is often subjected to changes due to the variation of load or disturbances induced within the transmission system. Power system stability is concerned with bringing system operation back within normal conditions as quickly as possible after a transient disturbance. Knowledge of power system stability is useful to electrical engineers employed in the power generation and distribution industry. Southwest Washington regional employers seeking this knowledge include utilities such as Bonneville Power Administration (BPA), and large power consumers such as semiconductor fabs.

It does not affect other units in Pullman and other campuses.

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ECE 569 Advanced Power Electronics Course Syllabus

Description: Advanced design, analysis, modeling and verification of applied power electronics and related control systems

Credits: 3

Prerequisite: A basic understanding of how to apply diodes, transistors, inductors and capacitors in power electronic circuits, such as rectifiers, switch-mode DC-DC converters, and power-factor correction circuits.

Required Text (available at the WSU Vancouver bookstore):

N. Mohan, T.M. Undeland, W.P. Robbins, "Power Electronics: Converters, Applications and Design, 3/e," John Wiley and Sons, 2003, ISBN 978-0-471-22693-2

Instructor: Dr. John Lynch

Office: VECS 301G
Phone: (360) 546-9252
Email: jdlynch@wsu.edu
Office hours: Whenever the office door is open
Lectures: MW 10:10 – 11:00am, location TBA
Lab: F 10:10 – 12:40pm, VECS 220

Course Overview

ECE 569 examines the application of electronics to power and energy conversion, with contemporary applications from powering handheld devices to grid-scale energy conversion. The course focusses on design-oriented analysis of topologies and control methods for various power electronic converters used for dc-dc, dc-ac and ac-dc power conversion for contemporary applications. The skills gained in this course will enable students to perform various tasks related to high power semiconductor devices, digital signal processing, and efficient electrical energy.

Topics Covered

- Review of power semiconductor switches, electric and magnetic circuit concepts.
- AC-DC conversion (diode rectifier, inductive filtering, controlled rectifier, effect of line inductance)
- DC-DC conversion (step-up, step-down, buck-boost, full-bridge)
- DC-AC conversion (pulse-width-modulation, and other switching schemes)
- Resonant converters (soft-switching techniques – ZCS and ZVS actions)
- DC power supplies (flyback, forward, and push-pull converters, switch control, protection and electrical isolation)
- Power conditioning and uninterruptable power supplies (UPS)
- DC motor drives
- AC motor drives (induction and synchronous)
- Residential and utility applications, optimizing the utility interface

Course Procedures

There will be two hours of lecture and one three-hour lab session each week. Reading and homework problems from the required textbook will be assigned each week. Weekly lab sessions will explore power electronic circuits using simulation tools such as PSpice.

Graduate Learning Outcome (GLO)

GLO-1: Students will be able to apply in-depth knowledge of power electronics to contemporary electric power conversion systems.

Learning Outcomes and Assessment

Student Learning Outcomes for this Course: **At the end of the course, the students should be able to:**	**Course Topics/Dates:** **The following date(s) will address this outcome :**	**Evaluation of Outcome :** **This outcome will be primarily evaluated by:**
Analyze and design AC-DC, DC-DC and DC-AC power converter circuits	Weeks 1-6	Homework, labs, Exam 1 & Final Exam
Analyze and design resonant converters	Week 8	Homework, labs, Exam 2 & Final Exam
Analyze and design speed controllers for DC, induction, and synchronous motors	Weeks 11-12	Homework, labs, Final Exam
Analyze and characterize power electronic circuits found in residential, industrial and utility applications	Weeks 13-14	Homework, labs, Final Exam

Website

All course materials (lecture notes, assignments, etc.) will be available on the course Blackboard website at https://learn.wsu.edu/.

Attendance Policy

Lecture attendance is highly encouraged but not required. Students are nevertheless responsible for knowing any and all material presented in lecture.

Composition of final grade

The course grade will be determined as follows:

Homework:	25%
Labs:	25%
Midterm Exam:	25%
Final Exam:	25%
Total	100%

Grading Scale (% of total score)

A	93-100	B	83-86	C	73-76	D	60-66
A-	90-92	B-	80-82	C-	70-72	F	< 60
B+	87-89	C+	77-79	D+	67-69		

Rounding will be applied when calculating the grade.

Make-up Exam/Assignment Policy

No make-up exams will be given, nor late homework assignment accepted, unless a medical or other emergency was the reason for missing the exam or the homework assignment. For any other reason you must first contact the instructor **before** missing an exam or an assignment.

Academic Integrity

Academic integrity is the cornerstone of the university and will be strongly enforced in this course. Any student found in violation of the academic integrity policy will be given an "**F**" for the course and will be referred to the Office of Student Conduct. For additional information about WSU's academic integrity policy/procedures, please contact (360) 546 9573.

Student with Disabilities

Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please call the Access Center at (360) 546-9238 or van.access.center@wsu.edu. Accommodations may take some time to implement so it is critical that you contact the Access Center as soon as possible.

Emergency Notification System

WSU has made an emergency notification system available for faculty, students, and staff. Please register at zzusis with emergency contact information (cell, email, text, etc.). You may have been prompted to complete emergency contact information when registering for classes at RONet. In the event of a building evacuation, a map at each classroom entrance shows the evacuation point for each building. Please refer to it. Finally, in case of class cancellation campus-wide, please check local media, the WSU Vancouver web page and/or http://www.flashalert.net/. Individual class cancellations may be made at the discretion of the instructor. Each individual is expected to make the best decision for their personal circumstances, taking safety into account. Safety plan website.

Audio, video, digital, commercial note-taking and other recording during class

During this course students are prohibited from making audio, video, digital, or other recordings during class, or selling notes to or being paid for taking notes by any person or commercial firm without the permission of the faculty member teaching this course.

ECE 569 Tentative Weekly Schedule

Week	Topic	Reading & Homework	Lab
1	Course overview, power semiconductor switches,	Ch. 1-2	MOSFET switching characteristics
2	Review of magnetic circuit concepts.	Ch. 3-4	Transformer design
3	AC-DC conversion (diode rectifier, inductive filtering, controlled rectifier, effect of line inductance)	Ch. 5-6	Diode rectifier circuits
4	DC-DC conversion (step-up, step-down, buck-boost, full-bridge)	Ch. 7	DC-DC buck converter circuits
5	Review; Exam 1	none	DC-DC boost converter circuits
6	DC-AC conversion (pulse-width-modulation, and other switching schemes)	Ch. 8	PWM inverter circuits
7	Resonant converters (soft-switching techniques – ZCS and ZVS actions)	Ch. 9	Resonant converters
8	DC power supplies (flyback, forward, and push-pull converters, switch control, protection and electrical isolation)	Ch. 10	Flyback and forward converter circuits
9	Review; Exam 2	none	Push-pull converter circuits
10	Power conditioning and UPS	Ch. 11	Power factor correction
11	DC motor drives	Ch. 12-13	DC motor drive circuits
12	AC motor drives (induction and synchronous)	Ch. 14-15	AC motor drive circuits
13	Residential and utility applications	Ch. 16-17	Induction heating circuit
14	Optimizing the utility interface	Ch. 18	Applying PWM inverters to wind and solar generation
15	Review for final exam	none	none
16	FINAL EXAM		