

Washington State University
MAJOR CURRICULAR CHANGE FORM - - COURSE
 (Submit original signed form and ten copies to the Registrar's Office, zip 1035.)

021
 RECEIVED
 AUG 15 2012
 WSU Registrar

Future Effective Date: 01/1/2013 New course Temporary course Drop service course
 (effective date cannot be retroactive) There is a course fee associated with this course (see instructions)

- Variable credit _____
- Increase credit (former credit _____)
- Number (former number _____)
- Crosslisting (between WSU departments)
(Must have both departmental signatures)
- Conjoint listing (400/500)
- Request to meet Writing in the Major [M] requirement (Must have All-University Writing Committee Approval)
- Request to meet GER in _____ (Must have GenEd Committee Approval) Fulfills GER lab (L) requirement
- Professional course (Pharmacy & Vet Med only) Graduate credit (professional programs only)
- Other (please list request) _____

EE 525 Power System Applications of Power Electronics

 course prefix course no. title

3	3	0	0	
credit	lecture hrs per week	lab hrs per week	studio hrs per week	prerequisite

Description (20 words or less) This course discusses applications of power electronic devices in the power compensation of transmission lines, integration of renewables, and HVDC transmission. It also discusses

incomplete description sent email

Instructor: Prof. Ali Mehrizi-Sani Phone number: 3356249 Email: mehrizi@eecs.wsu.edu
 Contact: _____ Phone number: _____ Email: _____
 Campus Zip Code: 2752

- Please attach rationale for your request, a current and complete syllabus, and explain how this impacts other units in Pullman and other branches (if applicable).
- Secure all required signatures and provide 10 copies to the Registrar's Office.

John J. White 7 Aug 12 _____
 Chair/date Dean/date General Education Com/date

 Chair (if crosslisted/interdisciplinary)* Dean (if crosslisted/interdisciplinary)* Graduate Studies Com/date

 All-University Writing Com/date Academic Affairs Com/date Senate/date

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

Washington State University
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(Must have both departmental signatures)
- Conjoint listing (400/500)
- Request to meet Writing in the Major [M] requirement (Must have All-University Writing Committee Approval)
- Request to meet GER in _____ (Must have GenEd Committee Approval) Fulfills GER lab (L) requirement
- Professional course (Pharmacy & Vet Med only) Graduate credit (professional programs only)
- Other (please list request) _____

- Repeat credit (cumulative maximum _____ hours)
- Lecture-lab ratio (former ratio _____)
- Prefix (former prefix _____)
- Cooperative listing (UI prefix and number _____)
taught by: WSU UI jointly taught
- S, F grading

EE 525 Power System Applications of Power Electronics
 course prefix course no. title

3	3	0	0	EE 486, EE491	
credit	lecture hrs per week	lab hrs per week	studio hrs per week		prerequisite

Description (20 words or less) Principles of operation of power electronic converters in modern power systems; FACTS devices, HVDC, compensation; microgrids and integration of renewable energy resources; modeling and control.

Instructor: Prof. Ali Mehrizi-Sani Phone number: 335-6249 Email: mehrizi@eecs.wsu.edu
Contact: _____ Phone number: _____ Email: _____
Campus Zip Code: 2752

- Please attach rationale for your request, a current and complete syllabus, and explain how this impacts other units in Pullman and other branches (if applicable).
- Secure all required signatures and provide 10 copies to the Registrar's Office.

 Chair/date

 Dean/date

 General Education Com/date

 Chair (if crosslisted/interdisciplinary)*

 Dean (if crosslisted/interdisciplinary) *

 Graduate Studies Com/date

 All-University Writing Com/date

 Academic Affairs Com/date

 Senate/date

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

E E 525 Course rationale:

With advances in the power system operational philosophy, gathered under the umbrella of the smart grid initiative, it is imperative to introduce students to the apparatus and techniques employed in the modern power system. The purpose of this course is to introduce students to applications of power electronics for improving controllability, efficiency, reliability, and stability of the power system. This course will equip students with analysis and design tools for integrating renewable energy resources, improving the capacity of electric power transmission lines, and increasing the efficiency of the electric power distribution network. This course strategically expands the power engineering curriculum at WSU to include the topics of contemporary interest.

525
EE 582 Power System Applications of Power Electronics
School of Electrical Engineering and Computer Science
Fall 2012

1 Course Overview

Title	EE 582 Power System Applications of Power Electronics
Semester	Fall 2012
Instructor	Prof. Ali Mehrizi-Sani
Email	mehrizi@eecs.wsu.edu
Office	EME 35
Phone	(509) 335-6249
Fax	(509) 335-3818
Lecture Room	SLOA 163
Lecture Hours	Tuesdays and Thursdays from 12:05 PM to 1:20 PM (note we start 5 minutes after the hour to allow you sit through Tuesday seminars)
Course Website	http://eecs.wsu.edu/~mehrizi/ee582
Office Hours	<ul style="list-style-type: none">• Wednesdays from 10:00 AM to 11:00 AM; or• Email me for an appointment with "EE 582" in the subject line.

This course discusses the applications of power electronics for the smart grid focusing on the flexible AC transmission system (FACTS devices). EE 582, in general, discusses HVDC transmission, static compensation, and series and shunt filters. This course will also discuss modeling and control of such devices. The goals of this course are to introduce you to (i) power electronics converter used in high power applications, (ii) applications of power electronics in the smart grid; and (iii) study analysis, modeling, and control methods employed for power electronics.

2 Required Background

You need to have taken the following courses. For each course, the topics that will be used in this course are listed. A general knowledge of other topics typically covered in the respective course is preferred.

EE 486 Power Electronics Basics of analysis techniques for power electronic converters. I will do a quick review of EE 486 at the beginning of the semester.

Power Systems Basics of power system analysis including power flow and VAR compensation.

PSCAD This is not an official prerequisite of the course, but you will need this software package to do some of the assignments of the course. A student version of PSCAD is available for download at https://pscad.com/products/pscad/free_downloads. A five-minute Youtube video tutorial is available at <http://www.youtube.com/watch?v=uzo2eHPsD2c>.

MATLAB/SIMULINK You also need to be familiar with MATLAB/SIMULINK for the programming assignments. Students who wish to have MATLAB/SIMULINK on their own personal computers can purchase MATLAB/SIMULINK Student Version from the Bookie or from <http://www.mathworks.com/store>. One great source is "MATLAB Programming Tips," from The MathWorks available for free at http://www.mathworks.com/help/pdf_doc/matlab/programming_tips.pdf.

3 Course Topics

The course topics include

- Review of steady-state power flow
- Review of power electronics
- Applications of converters for compensation of transmission systems, e.g., shunt, series, and hybrid compensation, such as switched capacitor, static synchronous compensator (STATCOM), static VAR compensator (SVC), thyristor-controlled reactor (TCR), thyristor-controlled series capacitor (TCSC), thyristor-switched series capacitor (TSSC), static synchronous series compensator (SSSC), unified power flow controller (UPFC), and interphase power flow controller (IPFC).
- High-voltage direct current (HVDC) systems
- Wind power systems (time permitting)
- Converter dynamic model and control, reference frames
- Microgrids and integration of distributed energy resource (DER) units

4 Textbook

No textbook is required. The following are (very) good references for FACTS.

- [1] N. G. Hingorani and L. Gyugyi, *Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems*. New York, NY: Wiley-IEEE Press, 2000. [Online]. Available: <http://ieeexplore.ieee.org/xpl/bkabstractplus.jsp?bkn=5264253>

ISBN: 978-0-470-54680-2.

This text is an IEEE classic and is freely available online through IEEEExplore.

- [2] R. M. Mathur and R. K. Varma, *Thyristor-Based FACTS Controllers for Electrical Transmission Systems*. New York, NY: Wiley-IEEE Press, 2002. [Online]. Available: <http://ieeexplore.ieee.org/xpl/bkabstractplus.jsp?bkn=5265762>

ISBN: 978-0-470-54668-0.

This text is an IEEE classic and is freely available online through IEEEExplore.

- [3] A. Yazdani and R. Iravani, *Voltage-Sourced Converters in Power Systems: Modeling, Control, and Applications*. New York, NY: Wiley-IEEE Press, 2010. [Online]. Available: <http://washingtontate.worldcat.org/oclc/609861255>

ISBN: 978-0-470-52156-4.

This text is freely available online through WSU libraries.

The following are useful references for power electronics:

- [1] D. W. Hart, *Power Electronics*. New York: McGraw-Hill, 2011, 512 pp.

ISBN: 980-0-073-38067-4; CALL NUMBER: TK7881.15 .H373 2011.

An up-to-date, neat, and concise text covering basics of converters.

- [2] M. H. Rashid, Ed., *Power Electronics Handbook: Devices, Circuits, and Applications*, 3rd ed. Burlington, MA: Elsevier, 2011, 1417 pp.

ISBN: 978-0-123-82036-5; CALL NUMBER: TK7881.15 .P6733 2011.

A very useful handbook on many aspects of power electronics. It includes a comprehensive treatment of the physics of devices and includes applications of different power electronic converters for different purposes. As an handbook, each chapter is independent of others and can be studied on its own.

- [3] Y. H. Song and A. T. Johns, Eds., *Flexible AC Transmission Systems (FACTS)*. London, UK: The Institution of Electrical Engineers, 1999.

A good reference on different aspects of FACTS devices. Individual chapters are written by world experts on the topics.

5 Evaluation

You will be assessed based on your assignments, midterm tests, and the final exam as shown below:

Assignments (40%) Approximately 4 assignments. Generally you will have about two weeks to work on each assignment. The assignment reports have to be submitted electronically as a PDF file to my email address by the midnight of the due date (typically Fridays). Extra credit may be given for an extraordinary assignment, e.g., solving bonus problems, an elegant solution, a comprehensive discussion, or an especially neat and tidy submission. You are free to choose between Word and L^AT_EX (or other tools), but to encourage producing beautiful technical documents, submissions that use L^AT_EX will receive 5% bonus ($m_{\text{updated}} = 1.05m_{\text{original}}$). Late assignments are accepted but marked at 20% reduction per day unless there is valid justification; that is, one day late: maximum mark 80%, two days: 60%, three days: 40%, four days: 20%, and five days: 0%. You may discuss assignment with your fellow students, but each person has to submit a separate report. Please try all assignments; they will help you in preparing for the final exam.

Letter	Range
A	90–100
B	80–90
C	70–80
D	60–70
F	0–60

Final Project (30%) See Section 6 below. Project proposals are due on **Monday, Oct. 1, 2012**. Final reports are due on **Monday, Dec. 3, 2012**.

Final Exam (30%) Two-hour comprehensive exam. Final Exam is scheduled for **Wednesday, Dec. 12, 2012**, from 8:00 AM to 10:00 AM. Please double check with the registrar's office.

Class Participation (0%) But can help you when in the boundary of letter grades.

6 Final Project

The final project is an important part of this course. The project is where you apply the analysis methods covered in class to an area of your interest. Please start thinking about the project early. Ideally you would select a project related to the subject of your thesis; I suggest you discuss your project with your supervisor to select a relevant topic. I do not require a "novel" contribution, but any innovation that leads to publishable material will guarantee a full mark for the project. Depending on the scope of the project, you can form teams of up to two people. Grading of the project will be based on the clarity and technical soundness of your report.

Naturally your project will have a significant simulation component. The project topics can include

- Case study, e.g., harmonics due to shunt compensation;
- Performance evaluation, e.g., effects of series compensation on mechanical modes;
- Design, e.g., design of controllers for an electronically interfaced DER unit; or
- Any combination of the above.

The project deliverables, all in PDF and communicated through email, are as follows. The deadlines for the final project are shown above in Section 5.

Project Proposal The project proposal includes the *title* and *objective* of your selected project.

Project Report The project results should be included in a final report in IEEE double-column style in no more than 6 pages. Both T_EX and Word templates are available on IEEE Author Digital Toolbox at http://www.ieee.org/publications_standards/publications/authors/authors_journals.html. Similar to a standard paper, the report should include title, abstract, introduction, methodology, simulation and results, discussion, future work and conclusion, and references.

7 Class Etiquette and Policies

I encourage you to attend classes. I also encourage you to discuss any problems/difficulties you may have in this course with me. Feel free to email me with your comments or questions. I will try to respond to your email messages within two business days. Please visit the course web site frequently; most course material, e.g., assignments, grades, and extra readings, will be communicated through the website.

8 Academic Integrity

Cheating or plagiarism in any form will not be tolerated. Cheating includes, but is not limited to, copying work or allowing your work to be copied. Plagiarism includes resubmitting previously graded homework or lab reports from a previous semester, even if they were your own work. All incidences of cheating will be reported to the Office of Student Standards and Accountability. The first incidence of cheating will result in an F for the course. A second incident of cheating will result in possible dismissal from the University. Please see <http://academicintegrity.wsu.edu>

9 Students 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 either visit or call the Access Center (Washington Building 217; (509) 335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.

10 Safety

Safety is a shared responsibility in which each member of the University community has a personal role. Each of us should know the appropriate actions to take when an emergency arises. For emergency preparedness, students are strongly encouraged to visit <http://oem.wsu.edu/emergencies>. Everyone is also encouraged to visit the wsu ALERT site <http://safetyplan.wsu.edu> for information about emergencies and the communication resources wsu will use during emergencies.

11 Disclaimer

Information contained in this document may change as required during the semester. Such changes will be communicated to you via email, in class, and on the website. Please make sure you attend all lectures to stay up-to-date.

Wherland, Scot

From: Ali Mehrizi-Sani [mehrizi@eecs.wsu.edu]
Sent: Thursday, September 27, 2012 10:47 PM
To: Wherland, Scot
Subject: Re: Catalog Agenda #27 EE 525
Attachments: EE525_2012_Outline.pdf

#27

Dear Prof. Wherland.

Thanks for the comments. My answers are below.

1. Yes. I updated the syllabus to have 525.
2. I have changed the wording on the syllabus to reflect this. Please disregard the prerequisites on the second form.
3. I understand there's an overlap in my grading scale, which is now fixed in the updated syllabus. As mentioned in the course syllabus, class participation will be used to decide in case of boundary marks. "Class Participation (0%) But can help you when in the boundary of letter grades." If required, I can provide a finer grading scheme.
4. The syllabus includes both descriptions: the catalog description (in the table in Section 1 right below course website) and the longer description. I rearranged this in the updated syllabus and shortened the catalog description to 20 words. The new catalog description is "Principles of operation of power electronic converters in modern power systems; FACTS, HVDC, microgrids, integration of renewables; modeling and control."

I'm attaching the updated syllabus. Please let me know if I can provide more clarification.

Best regards and thanks again,

Ali

On Thu, Sep 27, 2012 at 10:32 AM, Wherland, Scot <scot_wherland@wsu.edu> wrote:

Prof. Mehrizi-Sani,

Thank you for the new syllabus. I got a few more comments on the previous one from other members of the Committee.

1. The syllabus calls the course EE 582, the new course is apparently EE 525 to give it its own number, correct?
2. The prerequisites are listed on one cover sheet, but not the other (the one with signatures). Grad courses cannot have undergraduate prerequisites because there is no way to check them for graduate students, who typically gained their background at another university. "Graduate standing" is assumed for all grad courses. Listing the background expected is perfectly acceptable, it just will not be in the catalog and enforced by zzusis.

3. A minor point brought up by one committee member is the overlap of grading scales, what happens when you earn exactly 90, for example. WSU does allow + and – grades, but you are not required to use them.

4. You provided different course description on the two cover sheets. The one with signatures starts “This course discusses applications...” and the other one “Principles of operation of power...”. Each is more than 20 words. The catalog editor will shorten them, but if you want to write a shorter one to be used please do so.

The syllabus you send in is kept for our records, so please send me a copy with these changes. The description can be in the syllabus, or just in the email.

Thank you,

Scot

Scot Wherland

Professor of Chemistry

Boeing Science/Math Education

Distinguished Professor Voice: [509.335.3360](tel:509.335.3360)

Department of Chemistry FAX: [509.335.8867](tel:509.335.8867)

Washington State University Office: Fulmer 151

Pullman, WA 99164-4630 Email: scot_wherland@wsu.edu

From: Ali Mehrizi-Sani [<mailto:mehrizi@eecs.wsu.edu>]

Sent: Thursday, September 20, 2012 10:58 PM

To: Wherland, Scot

Subject: Re: Catalog Agenda #27 EE 525

Professor Wherland,

I'm attaching the updated syllabus (and some other modifications to make it close to the WSU's template). Please let me know if any other modifications are needed.

Best regards,
Ali

On Thu, Sep 20, 2012 at 8:42 AM, Ali Mehrizi-Sani <mehrizi@eecs.wsu.edu> wrote:

Dear Professor Wherland,

Thanks for letting me know of the anticipated issue. I was under impression that a statement regarding "learning outcomes" is needed only for undergraduate courses. I will update and send you the syllabus soon.

Best regards,

Ali

--

Ali Mehrizi-Sani
Assistant Professor
School of Electrical Engineering and Computer Science
Washington State University
EME 35 - 355 NE Spokane Street
Pullman, WA 99164-2752

Tel: +1 (509) 335-6249

Fax: +1 (509) 335-3818

Email: mehrizi@eecs.wsu.edu

Webpage: http://eecs.wsu.edu/~mehrizi

On Thu, Sep 20, 2012 at 7:44 AM, Wherland, Scot <scot_wherland@wsu.edu> wrote:

Prof. Mehrizi-Sani,

Catalog has received your request to establish EE 525 509. I lead the discussion of proposals from Engineering, and there is one issue I can anticipate. The syllabus does not quite meet the current requirements, please see <http://dev.ugr.wsu.edu/faculty/syllabustemplate.html> . In particular, "Learning Outcomes" are now required.

A new syllabus can be sent back through me, you do not need to resubmit.

Thank you,

Scot Wherland

Scot Wherland

Professor of Chemistry

Boeing Science/Math Education

XREVISEDX

#27



EE 525 Power System Applications of Power Electronics School of Electrical Engineering and Computer Science Fall 2012

1 Course Overview

Title	EE 525 Power System Applications of Power Electronics
Credits	Three credit hours
Semester	Fall 2012
Instructor	Prof. Ali Mehrizi-Sani
Email	mehrizi@eecs.wsu.edu
Office	EME 35
Phone	(509) 335-6249
Fax	(509) 335-3818
Lecture Room	SLOA 163
Lecture Hours	Tuesdays and Thursdays from 4:15 PM to 5:30 PM
Course Website	http://eecs.wsu.edu/~mehrizi/ee582
Office Hours	<ul style="list-style-type: none">• Wednesdays from 10:00 AM to 11:00 AM; or• Email me for an appointment with "EE 525" in the subject line.



Catalog Description	Principles of operation of power electronic converters in modern power systems; FACTS, HVDC, microgrids, integration of renewables; modeling and control.
Longer Description	This course discusses the applications of power electronics for the smart grid focusing on the flexible AC transmission system (FACTS) devices. EE 525, in general, discusses HVDC transmission, series and shunt compensation, and active filters. This course will also discuss modeling and control of such devices. The goals of this course are to introduce you to (i) power electronics converter used in high power applications, (ii) applications of power electronics in the smart grid; and (iii) study analysis, modeling, and control methods employed for power electronics.

2 Required Background by Topic

You need to have taken the following courses. For each course, the topics that will be used in this course are listed. A general knowledge of other topics typically covered in the respective course is preferred.

Power Electronics (EE 486 at WSU) Basics of analysis techniques for power electronic converters.

Power Systems (EE 491 at WSU) Basics of power system analysis, e.g., power flow and compensation.

PSCAD/EMTDC This is not an official prerequisite of the course, but you will need this software package to do some of the assignments of the course. A student version of PSCAD is available for download at https://pscad.com/products/pscad/free_downloads. We have 25 license seats at WSU. Ask EECs helpdesk <support@eecs.wsu.edu> to see how you can use them for this course.

MATLAB/SIMULINK You also need to be familiar with MATLAB for the programming assignments. Students who wish to have MATLAB on their own personal computers can purchase MATLAB Student Version from the Bookie or from <http://www.mathworks.com/store>. One great source is "MATLAB Programming Tips," from The MathWorks available for free at http://www.mathworks.com/help/pdf_doc/matlab/programming_tips.pdf.

3 Learning Outcomes

At the end of this course, you are expected to

- Explain the purpose and principles of operation of FACTS devices;
- Analyze the nonsinusoidal voltage and/or current resulting from a FACTS device;
- Compare and contrast different compensation methods (series, shunt, hybrid, and phase);
- Analyze the steady-state operation of a vsc and harmonic elimination techniques;
- Design a controller for a vsc based on application, e.g., a STATCOM application;
- Derive the dynamic model of a given FACTS device; and
- Compare different modes of operation of a microgrid based on available standards.

4 Course Topics

The course topics include

- Course overview
- Review of power electronics
- Review of steady-state power flow
- Applications of converters for compensation of transmission systems, e.g., shunt, series, and hybrid compensation, such as switched capacitor, static synchronous compensator (STATCOM), static VAR compensator (SVC), thyristor-controlled reactor (TCR), thyristor-controlled series capacitor (TCSC), thyristor-switched series capacitor (TSSC), static synchronous series compensator (SSSC), unified power flow controller (UPFC), and interphase power flow controller (IPFC).
- High-voltage direct current (HVDC) systems
- Wind power systems (time permitting)
- Converter dynamic model and control, reference frames
- Microgrids and integration of distributed energy resource (DER) units

5 Textbook

No textbook is required. The following are (very) good references for FACTS.

- [1] N. G. Hingorani and L. Gyugyi, *Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems*. New York, NY: Wiley-IEEE Press, 2000. [Online]. Available: <http://ieeexplore.ieee.org/xpl/bkabstractplus.jsp?bkn=5264253>

ISBN: 978-0-470-54680-2.

This text is an IEEE classic and is freely available online through IEEEExplore.

- [2] R. M. Mathur and R. K. Varma, *Thyristor-Based FACTS Controllers for Electrical Transmission Systems*. New York, NY: Wiley-IEEE Press, 2002. [Online]. Available: <http://ieeexplore.ieee.org/xpl/bkabstractplus.jsp?bkn=5265762>

ISBN: 978-0-470-54668-0.

This text is an IEEE classic and is freely available online through IEEEExplore.

- [3] A. Yazdani and R. Iravani, *Voltage-Sourced Converters in Power Systems: Modeling, Control, and Applications*. New York, NY: Wiley-IEEE Press, 2010. [Online]. Available: <http://washingtonstate.worldcat.org/oclc/609861255>

ISBN: 978-0-470-52156-4.

This text is freely available online through WSU libraries. An up-to-date errata is available on the author's website at <http://www.ee.ryerson.ca/~yazdani/YazdaniErrata.pdf>

The following are useful references for power electronics:

- [1] D. W. Hart, *Power Electronics*. New York: McGraw-Hill, 2011, 512 pp.
ISBN: 980-0-073-38067-4; CALL NUMBER: TK7881.15 .H373 2011.
An up-to-date, neat, and concise text covering basics of converters.
- [2] M. H. Rashid, Ed., *Power Electronics Handbook: Devices, Circuits, and Applications*, 3rd ed. Burlington, MA: Elsevier, 2011, 1417 pp.
ISBN: 978-0-123-82036-5; CALL NUMBER: TK7881.15 .P6733 2011.
A very useful handbook on many aspects of power electronics. It includes a comprehensive treatment of the physics of devices and includes applications of different power electronic converters for different purposes. As an handbook, each chapter is independent of others and can be studied on its own.
- [3] Y. H. Song and A. T. Johns, Eds., *Flexible AC Transmission Systems (FACTS)*. London, UK: The Institution of Electrical Engineers, 1999.
A good reference on different aspects of FACTS devices. Individual chapters are written by world experts on the topics.

6 Evaluation

You will be assessed based on your assignments, midterm tests, and the final exam as shown below:

Assignments (40%) Approximately 4 assignments. Generally you will have about two weeks to work on each assignment. The assignment reports have to be submitted electronically as a PDF file to my email address by the midnight of the due date (typically Wednesdays). Name the file according to the following pattern: EE582_HW#_Lastname_Firstname.PDF. Use the IEEE two-column format (see Section 7 for details).

Extra credit may be given for an extraordinary assignment, e.g., solving bonus problems, an elegant solution, a comprehensive discussion, or an especially neat and tidy submission. You are free to choose between Word and \LaTeX (or other tools), but to encourage producing beautiful technical documents, submissions that use \LaTeX will receive 5% bonus ($m_{\text{updated}} = 1.05m_{\text{original}}$). Late assignments are accepted but marked at 20% reduction per day unless there is valid justification; that is, one day late: maximum mark 80%, two days: 60%, three days: 40%, four days: 20%, and five days: 0%. You may discuss assignment with your fellow students, but each person has to submit a separate report. Please try all assignments; they will help you in preparing for the final exam.

Letter	Range
A	90–100
B	80–89
C	70–79
D	60–69
F	0–59

Final Project (30%) See Section 7 below. Project proposals are due on **Monday, Oct. 1, 2012**. Final reports are due on **Monday, Dec. 3, 2012**.

Final Exam (30%) Two-hour comprehensive exam. Final Exam is scheduled for **Monday, Dec. 10, 2012**, from 3:10 PM to 5:10 PM. Please double check with the registrar's office.

Class Participation (0%) But can help you when in the boundary of letter grades.

7 Final Project

The final project is an important part of this course. The project is where you apply the analysis methods covered in class to an area of your interest. Please start thinking about the project early. Ideally you would select a project related to your thesis; I suggest you discuss your project with your supervisor to select a relevant topic. I do not require a “novel” contribution, but *any innovation that leads to publishable material*

will guarantee a full mark for the project. Depending on the scope of the project, you can form teams of up to two people. Grading of the project will be based on the clarity and technical soundness of your report.

Naturally your project will have a significant simulation component. The project topics can include

- Case study, e.g., harmonics due to shunt compensation;
- Performance evaluation, e.g., effects of series compensation on mechanical modes;
- Design, e.g., design of controllers for an electronically interfaced DER unit; or
- Any combination of the above.

The project deliverables, all in PDF and communicated through email, are as follows. The deadlines for the final project are shown above in Section 6.

Project Proposal The project proposal (maximum one page) includes the *title* and *objective* of your selected project.

Project Report The project results should be included in a final report in IEEE double-column style in no more than 6 pages. Both \TeX and Word templates are available on IEEE Author Digital Toolbox at http://www.ieee.org/publications_standards/publications/authors/authors_journals.html. Similar to a standard paper, the report should include title, abstract, introduction, methodology, simulation and results, discussion, future work and conclusion, and references.

8 Class Etiquette and Policies

- I encourage you to attend classes. I also encourage you to discuss any problems/difficulties you may have in this course with me.
- Feel free to email me with your comments or questions. I will try to respond to your email messages within two business days. Please send all correspondence from your WSU assigned email address. This is so I can protect your personal educational records detailed in the FERPA guidelines (<http://www.registrar.wsu.edu/Registrar/Apps/FERPA.ASPX>). Please also include your Student ID in every email.
- Please visit the course web site frequently; most course material, e.g., assignments, grades, and extra readings, will be communicated through the website.

9 Academic Integrity

Cheating or plagiarism in any form will not be tolerated. Cheating includes, but is not limited to, copying work or allowing your work to be copied. Plagiarism includes resubmitting previously graded homework or lab reports from a previous semester, even if they were your own work. All incidences of cheating will be reported to the Office of Student Standards and Accountability. The first incidence of cheating will result in an F for the course. A second incident of cheating will result in possible dismissal from the University. Please see <http://academicintegrity.wsu.edu>

10 Students 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 either visit or call the Access Center (Washington Building 217; (509) 335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.

II Safety

Safety is a shared responsibility in which each member of the University community has a personal role. Each of us should know the appropriate actions to take when an emergency arises. For emergency preparedness, students are strongly encouraged to visit <http://oem.wsu.edu/emergencies>. Everyone is also encouraged to visit the wsu ALERT site <http://safetyplan.wsu.edu> for information about emergencies and the communication resources wsu will use during emergencies.

12 Disclaimer

Information contained in this document may change as required during the semester. Such changes will be communicated to you via email, in class, and on the website. Please make sure you attend all lectures to stay up-to-date.