ACADEMIC INTERGRITY POLICY

“You are responsible for making yourself aware of and understanding the policies and procedures in the Undergraduate and Graduate Catalogs that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. [The policies can be found at http://catalog.wmich.edu under Academic Policies, Student Rights and Responsibilities.] If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s). If you believe you are not responsible, you will have the opportunity for a hearing. You should consult with your instructor if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.”

In addition, instructors are encouraged to direct students to www.wmich.edu/conduct, www.wmich.edu/registrar and www.wmich.edu/disabilityservices to access the Code of Honor and general academic policies on such issues as diversity, religious observance, student disabilities, etc.

OFFICIAL CONTACT PLACES/HOURS:
Name: Johnson Asumadu  Email: johnson.asumadu@wmich.edu
Office: CEAS B-224  Office Hours: 10:30–11:30 a.m. MW & by appointment
Tel: +1 (269) 276 – 3147  Fax: +1 (269) 276 – 3151
Classroom Assigned: CEAS D – 0201  Class Hours: 6:30 – 9:10 p.m. M
Lab Room Assigned: B-0216  Lab Hours: TBA
Web Site Addresses: URL for course: http://homepages.wmich.edu/~asumadu/index.html

PRE-REQUISITES: ECE 4200-5200 or equivalent; with a grade of “C” or better. (or Equivalent)

KEY DATES: 1st Hour Test February 26, 2018 Normal Class Hour
2nd Hour Test April 16, 2018 Normal Class Hour
Final Examination: According to University Examination Schedule

COURSE MATERIALS:
Course Text Books and Materials:
1) “Fundamentals of Power Electronics” 2nd Edition by Erickson. (Required)
2) “Elements of Power Electronics” 1st Edition by Philip Krein. (Reference)
3) “Schematic Capture with Cadence PSpice”, 3rd Edition by M. E. Herniter. (Required)
4) “SPICE for Power Electronics and Electric Power”, 2nd Edition by Rashid. (Reference)
5) “MATLAB with Simulink”, By MathWorks.

CATALOG DESCRIPTION:
Isolated transformer and resonant switch mode converter topologies. Steady-state analysis, large-signal and small-signal modeling and analyses, and state-space and discrete time models. Magnetics, transformers, control techniques, and power conditioning of converters. PWM control. Advanced application areas: - HVDC, FACTS and STATCOM. Gallium, arsenide (GaAs), polytypes of silicon carbide (SIC), and gallium nitrate (GaN) semi-conductive devices introduced.

Pre-requisites by topic:
1. Circuit analysis, use of PSPICE and MATLAB with Simulink
2. Semiconductor diodes, BJTs, FETs including PSPICE models and electronics circuits.

**COURSE OBJECTIVES:**

1. Provide seniors/graduates/practicing engineers with rigorous and in depth sufficient treatment of the power electronics to enable students to acquire the knowledge and skills needed to design practical and integrated power electronics systems.
2. Use simulation tool for analysis and as a design verification tool.
3. Integrate digital signal processing strategies into design concepts.

**LEARNING OUTCOMES (The relevant ECE Department learning outcomes a-k (ABET), are included in parenthesis):**

1. Advance studies of power electronics for conversion, protection, and control of electrical energy. (*a b c d e f h i k*)
2. Ability to use a simplified building block (power-pole) to design and to analyze power electronics converters. (*a b c d e i k*)
3. Ability to model and to analyze converter circuits in steady-state (in continuous and discontinuous conduction modes), and to computer losses and efficiency. (*a b c e i k*)
4. Ability to model and to analyze converter dynamics using basic small-signal and state-space averaging techniques in continuous and discontinuous modes. (*a b c d e i k*)
5. Apply control techniques (transfer functions and controller design) to meet desire switching objectives and specifications. (*a b c d e g i k*)
6. Ability to select components, interpret terminal characteristics of the components, model components, design circuit, and understanding operation of power electronics converters. (*c d e i k*)

**Policy on Homework and PSpice/Project:**

Homework assignments and PSpice/Projects are assigned during class periods and are due at the scheduled time. **Problems must be done neatly, submitted in numerical order on 8 1/2 X 11 inch paper, one side only. HOMEWORK AND PSpICE/PROJECT TURNED IN LATE WILL RECEIVE NO CREDIT.**

**COURSE EVALUATION:**

| Individual Record Keeping (Maximum Points: 10%) |  |
| Homework Assignments (Maximum Points: 10%) |  |
| Examinations (Maximum Points: 70%) |  |
| 2 Mid Term Tests (20% of each) |  |
| Final Examination (30%) |  |
| PSpice/MATLAB Assignment (Maximum Points: 20%) |  |
| PSpice/MATLAB and 3 Lab Experiments |  |

**Grading Scale**

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<thead>
<tr>
<th>Maximum Points (%)</th>
<th>GRADE</th>
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<tbody>
<tr>
<td>90 - 100</td>
<td>A</td>
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<tr>
<td>85 - 89</td>
<td>BA</td>
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<td>80 - 84</td>
<td>B</td>
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<td>75 - 79</td>
<td>CB</td>
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<td>67 - 74</td>
<td>C</td>
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<td>60 - 66</td>
<td>D</td>
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<td>59 &amp; BELOW</td>
<td>E</td>
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Policy on Homework and MATLAB & SIMULINK, SPICE/Project:
Homework, group, and design problems are assigned during class periods and are due at the scheduled time. **Problems must be done neatly, submitted in numerical order on 8 1/2 X 11 inch paper, one side only. HOMEWORK AND MATLAB & SIMULINK, SPICE/PROJECT TURNED IN LATE WILL RECEIVE NO CREDIT.** If you have questions about any homework, Project work or do not understand any course materials, you must see me in B-224 as soon as possible. Solutions to all homework and design problems will be made available.

Please do not skip doing homework. Do not rely on reading through the solutions as techniques for studying for the course. The practice of consulting the solution before working a problem is a bad habit to acquire. It is much better to spend the effort trying to do the solution on your own - even if you are not able to complete the solution. You will find that the homework, though not impossible, is usually harder than the exam questions. Solving other problems on your own is the best way to understand the course materials and to study for the exams. There is a strong correlation between homework scores and course grades. Furthermore, homework scores are important in deciding borderline cases when determining course grades. **You are responsible for all pre-requisites especially ECE 4200-5200 (or equivalent).**

Policy on Class Attendance:
I highly recommend that you attend classes. Please, make every effort to attend every class. Low attendance is almost always correlated with low grades. “**You must be present to win**”.

**DISCLAIMER ON THE WEB:** THE UNIVERSITY AND I WILL NOT BE HELD LIABLE FOR ANY ERRORS OR INACCURACIES ON THIS WEBSITE.

**EMAILS:** I WILL TREAT ALL EMAILS AS NON-CONFIDENTIAL UNLESS REQUESTED BY STUDENT. IF ANY EMAIL SENT TO ME TO REQUEST INFORMATION THAT I BELIEVE WILL HELP OTHER STUDENTS, I WILL COPY THE REPLY TO ALL STUDENTS.

**General Policy on use of Electronic Equipment During Tests/Examinations**
1. Electronic calculators **CANNOT** be shared.
2. All cell phones/wifi equipment must be turned off and NOT be on sight (preferably in your backpack).
3. I will vigorously inspect and make sure that your ipad/surface/etc. can only be used for ebook or eText etc. and if necessary these must be loaded before coming for test and/or exam. There should be NO attempt to photograph the test/exam materials. That will be considered as an attempt to email the test/exam materials.
COURSE SCHEDULE

January
8 – 29 Elements of Power Electronics
   Fields – analog circuits, electronic devices, control systems
   Power systems, magnetics, electrical machines
   Converters:
      Building Blocks – common topologies, average models, Xformers
      - Buck, Boost, Buck-Boost
      steady-state analysis, modeling
   Switching – 1st/2nd/3rd/4th Quadrant, Practical Circuits – Diode, BJT, FET
   Open Collector Inverter, Low Side, High Side

February
5 – 19 Other Converters – Cuk, SEPIC, Watkins-Johnson, Current Feed Bridge, etc
   Cascading of converters
   Transformer Isolation – Half-/Full-Bridge, Forward Converter, Push-pull,
   Flyback, Boost Derived, etc.
   Resonant Converters
   Dynamic Circuit Modeling and Control of Converters.
      State-Space Averaging, Average and Average Switch Modeling
   PWM Control
   Controller Design

February 26 1ST HOURLY TEST

19 – 26 PWM Control
   Controller Design

26 – March 19 Converter Transfer Functions
   Magnetics and Transformer Design
   PWM Control

26 – April 9 WPT, HVDC

April 16 2nd HOURLY TEST

16 – 20 FACTS, STATCOM

FINAL EXAMINATION: ACCORDING TO UNIVERSITY SCHEDULE

NOTE:  (i) AT THIS TIME I DO NOT INTEND TO GIVE ANY MAKEUP
   HOMEWORK/TESTS/EXAM.
   (ii) ALL THE INFORMATION PROVIDED ABOVE IS TENTATIVE AND SUBJECT TO
   CHANGE WITHOUT NOTICE.