Western Michigan University, Electrical and Computer Engineering Department
ECE 6950 Advanced Electric Drives (3 - 0) Spring 2017 Course Information and Policies
CRN: 16082 - 100 6:30 – 9:20pm M (Lecture: Asumadu)

ACADEMIC INTEGRITY POLICY
“Students are responsible for making themselves aware of and understanding the University policies and procedures that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. The academic policies addressing Student Rights and Responsibilities can be found in the Undergraduate Catalog at http://catalog.wmich.edu/content.php?catoid=24&navoid=974 and the Graduate Catalog at http://catalog.wmich.edu/content.php?catoid=25&navoid=1030 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) and 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, students are encouraged to access the Code of Honor, as well as resources and general academic policies on such issues as diversity, religious observance, and student disabilities:

- Office of Student Conduct www.wmich.edu/conduct
- Division of Student Affairs www.wmich.edu/students/diversity
- Registrar’s Office www.wmich.edu/registrar and www.wmich.edu/registrar/policies/interfaith
- Disability Services for Students www.wmich.edu/disabilityservices”

RELIGIOUS OBSERVANCES POLICY:

OFFICIAL CONTACT PLACES/HOURS:
Name: Johnson Asumadu Email: johnson.asumadu@wmich.edu
Office: FLYOD B-224 Office Hours: 10:30 – 11:30 am MW and by appointment
Tel: +1 (269) 276 – 3147 Fax: +1 (269) 276 – 3151
Classroom Assigned: FLYOD C-0136 Class Hours: 6:30 – 9:20pm M
Lab Room Assigned: NA Lab Hours: NA
Web Site Addresses: URL for course: http://homepages.wmich.edu/~jasumadu/

PRE-REQUISITES
ECE 3200 (or Equivalent) and ECE3300 (or Equivalent)

KEY DATES
1st Hour Test February 27, 2017 Normal Class Hour
2nd Hour Test April 17, 2017 Normal Class Hour
Final Examination: According to University Examination Schedule

COURSE MATERIALS
2) “Electric Drives” 2001 Edition By Krishnan (Reference)
3) “MATLAB for Electrical & Computer Engineering etc” 2013 Edition By Priemer (Required)
4) “Schematic Capture with Cadence PSpice”, 2013 Edition By M. E. Herniter. (Reference)
6) “MATLAB & SIMULINK”, By MathWorks. (Required)

**PRE-REQUISITE**  
ECE 5200 (or Equivalent) and ECE 5300 (or Equivalent)  
1. Circuit analysis and use of PSPICE and MATLAB & SIMULINK.  
2. Electromagnetic devices, rotating machines and three-phase distribution systems.  
3. Semiconductor power switches including PSPICE models and power electronics circuits.  

**COURSE OBJECTIVES**  
1. Provide Seniors/Graduates/Practicing Engineers with rigorous and in depth sufficient treatment of Electric Drives to enable students to acquire the knowledge and skills needed to design practical and integrated Electric Drives.  
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))**  
1. Advance studies of electric drives using vector analysis.  
2. Ability to use space vectors for induction machine equations in phase quantities.  
3. Ability to perform dq-analysis of electric drives.  
4. Understanding the mathematical description of vector control.  
5. Ability to demonstrate the detuning effects on electric drives vector control.  
6. Ability to model and control electric drives.  
7. Apply power electronics control techniques (transfer functions and controller design) to meet desire control objectives and specifications of electric drives.  
8. Ability to select components, interpret terminal characteristics of the components, model components, design circuit, and understanding operation of power electronics converters.  

**COURSE EVALUATION**  

<table>
<thead>
<tr>
<th>Individual Record Keeping (Maximum Points: 10%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework Assignments (Maximum Points: 10%)</td>
</tr>
</tbody>
</table>

| Examinations (Maximum Points: 70%)            |
| 2 Mid Term Tests (20% of each)               |
| Final Examination (30%)                      |

**MATLAB Assignment (Maximum Points: 20%)**  

**MATLAB Grading Scale**  

<table>
<thead>
<tr>
<th>Maximum Points (%)</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 85</td>
<td>A</td>
</tr>
<tr>
<td>84 - 80</td>
<td>BA</td>
</tr>
<tr>
<td>79 - 75</td>
<td>B</td>
</tr>
<tr>
<td>74 - 70</td>
<td>CB</td>
</tr>
<tr>
<td>69 - 65</td>
<td>C</td>
</tr>
<tr>
<td>64 - 60</td>
<td>D</td>
</tr>
<tr>
<td>59 &amp; BELOW</td>
<td>E</td>
</tr>
</tbody>
</table>

**Policy on Homework and SPICE/MATLAB & SIMULINK/Project:**  
Homework assignments and MATLAB & SIMULINK/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 SPICE/MATLAB & SIMULINK/PROJECT TURNED IN LATE WILL RECEIVE NO CREDIT.**  

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

On Saturday April 22, 2017 I will assign you a tentative course grade after TEST II. Please, let me know by 12:00 p.m. on Sunday April 23, 2017 if you will accept the grade by emailing me just "YES." If you do NOT, you just email me “NO.” If I do NOT hear from you, I will assume that you do NOT accept the above-assigned grade.

If you do NOT accept the grade assigned above, the above grading system becomes NULL and VOID and the final exam is on Monday April 24, 2016 at 7:15 p.m. The grading system will be based on the course outline given at the beginning of the semester.
COURSE SCHEDULE

January
9 – 27  Electric Drive Systems
       Mathematical Description of Space Vector
       Using Space Vectors for Induction Machine Equations in Phase Quantities
       DQ-Analysis of Induction Machines

30 – February 17  Mathematical Description of Vector Control
                  Vector Control of Induction-motor Drives: a Qualitative Examination

February 27  1ST HOURLY TEST

February
27 – March 13  Detuning Effects in Induction Motor Vector Control
               Space Vector Pulse-width-modulated(SV-PWM) Inverters

March
13 – April 3   Direct Torque Control (DTC)
               Encoder-less Operation of Induction Motor Drives
               Vector Control of Permanent-magnet Synchronous Motor Drives

April
10 – 17       Switched-Reluctance Motor (SRM) Drives

April 17  2nd HOURLY TEST

FINAL EXAMINATION: ACCORDING TO UNIVERSITY SCHEDULE

COMPUTER DESIGN ASSIGNMENTS

There will be at least five computer design assignments. Students may use the MATLAB & SIMULINK/PSPICE software installed on the server at CAE’s center for the computer assignments. Students may also purchase their own copies from Math Works, Inc. MATLAB & SIMULINK/PSPICE software is more appropriate for this course. However, students who use any other software must make sure that they include all programs generated in their reports.

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.
<table>
<thead>
<tr>
<th>#</th>
<th>ACTIVITY</th>
<th>DUE DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Homework 1</td>
<td>January 30, 2017</td>
</tr>
<tr>
<td>2</td>
<td>Homework 2</td>
<td>February 06, 2017</td>
</tr>
<tr>
<td>3</td>
<td>Project 1</td>
<td>February 06, 2017</td>
</tr>
<tr>
<td>4</td>
<td>Homework 3</td>
<td>February 13, 2017</td>
</tr>
<tr>
<td>5</td>
<td>Project 2</td>
<td>February 27, 2017</td>
</tr>
<tr>
<td>6</td>
<td>TEST 1</td>
<td>February 27, 2017</td>
</tr>
<tr>
<td>7</td>
<td>Homework 4</td>
<td>March 20, 2017</td>
</tr>
<tr>
<td>8</td>
<td>Homework 5</td>
<td>March 27, 2017</td>
</tr>
<tr>
<td>9</td>
<td>Project 3</td>
<td>March 20, 2017</td>
</tr>
<tr>
<td>10</td>
<td>Homework 6</td>
<td>April 10, 2017</td>
</tr>
<tr>
<td>11</td>
<td>Project 4</td>
<td>April 10, 2017</td>
</tr>
<tr>
<td>12</td>
<td>TEST II</td>
<td>April 17, 2017</td>
</tr>
</tbody>
</table>