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. 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.

Students and instructors are responsible for making themselves aware of and abiding by the “Western Michigan University Sexual and Gender-Based Harassment and Violence, Intimate Partner Violence, and Stalking Policy and Procedures” related to prohibited sexual misconduct under Title IX, the Clery Act and the Violence Against Women Act (VAWA) and Campus Safe. Under this policy, responsible employees (including instructors) are required to report claims of sexual misconduct to the Title IX Coordinator or designee (located in the Office of Institutional Equity). Responsible employees are not confidential resources. For a complete list of resources and more information about the policy see www.wmich.edu/sexualmisconduct.

In addition, students are encouraged to access the Code of Conduct, 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
- University Relations Office http://www.wmich.edu/policies/religious-observances-policy
- Disability Services for Students www.wmich.edu/disabilityservices.”

OFFICIAL CONTACT PLACES/HOURS:
Name: Johnson Asumadu  
Email: johnson.asumadu@wmich.edu
Office: CEAS B-0224  
Office Hours: 10:30 – 11:30 am MW or by Appointment
Tel: +1 (269) 276 – 3147  
Fax: +1 (269) 276 – 3151
Classroom Assigned: CEAS C-0141  
Class Hours: 6:30 – 9:10 p.m. M
Lab Room Assigned: NA  
Lab Hours: NA

PRE-REQUISITES  
ECE 5200 (or Equivalent) and ECE 4300/5300 (or Equivalent)

KEY DATES  
1st Hour Test  February 25, 2019  Normal Class Hour
2nd Hour Test  April 15, 2019  Normal Class Hour
Final Examination: According to University Examination Schedule

COURSE MATERIALS
1. “Practical Solution Guide to Arc Flash Hazards,” EasyPower, LLC 2012 2nd Ed by EsayPower (Required)
5. K & E Time-Current Curves 11”x17” – Types: Given at First Day of Classes
4. **Scientific Calculator** that has at least the following features: (i) performs operations for real numbers and complex numbers without requiring the user to perform the operations on the real part and the imaginary part, or magnitude and angle, separately, (ii) solves linear algebra equations, including the case where the coefficients are complex, (iii) perform repetitive computations, and (iv) finds roots of polynomials, linear and nonlinear equations, and (v) finds the inverse of at most 3x3 square matrix.


**PRE-REQUISITE**  
ECE 5200 (or Equivalent) or ECE 4300/5300 (or Equivalent)

2. Arc Flash standards, calculation procedures  
3. Use of ETAP and Paladin for fault analysis.

**COURSE OBJECTIVES**

1. Provide Seniors/Graduates/Practicing Engineers with rigorous and in depth sufficient treatment of advanced topics in the protection and control of power systems to enable students to acquire the knowledge and skills needed to design practical and integrated Arc Flash Systems.  
2. Use simulation tool for analysis and as a design verification tool.  
3. Integrate analysis and strategies into design concepts.

**LEARNING OUTCOMES (The relevant ECE Department learning outcomes a-k (ABET))**

1. Advance studies of power quality issues. (a, b, c, d, e, f, h, i, k)  
2. Ability to use series and shunt filters. (a, b, c, d, e, i, k)  
3. Ability to perform dq-analysis of power systems. (a, b, c, e, i, k)  
4. Understanding the mathematical description of p-q transformation in 3-phase/3-wire and 3-phase/4-wire systems.  
5. Ability to demonstrate the detuning effects on electric drives vector control.  
6. Ability to model and control electric drives. (a, b, c, d, e, i, k)  
7. Apply power electronics converter techniques (transfer functions and controller design) to meet desire control objectives and specifications of filters in power systems. (a, b, c, d, e, g, i, k)

**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%)

**Computer Analysis of Arc Fault Assignment (Maximum Points: 20%)**

ETAP/PALADIN

**Grading Scale**

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

General Policy on use of Electronic Equipment During Tests/Examinations
1. Materials
All my tests and exams are open books/notes or anything printed on paper. I will ask that you bring green/blue book for tests/final examinations.

2. Calculator
You will not be allowed to share calculators. Your calculator must be able to perform the following:
(a) Performs operations for real numbers and complex numbers without requiring the user to perform the operations on the real part and the imaginary part, or magnitude and angle, separately,
(b) solves linear/nonlinear algebra equations, including the case where the coefficients are complex,
(c) perform repetitive computations, and
(d) finds roots of polynomials, linear and nonlinear equations, and
(e) finds the inverse of at most 3x3 square matrix.

3. Electronic Equipment During Tests/Examinations
NO electronic equipment with WIFI/any form of communication connection will be accepted. They must NOT be on sight (preferably in your backpack). This includes:
(a) Cell Phones
(b) I pads/Surfaces/etc.
(c) Laptops, Desktop Computers, etc.
(d) etc.

If you see a student cheating, it is your responsibility to quietly call my attention to that. We must all stamp out cheating.
COURSE SCHEDULE

January
07 – 28 System Power Flow Analysis
- Bus Admittance, Power Flow Equations, Newton-Rapson Method, Line Flows and Losses
- Transients, Unsymmetrical and Symmetrical Three-Phase Faults
- Symmetrical Components, Sequence Networks, Balanced Fault, and Unbalanced Faults
- Faults: Three-phase, Single line-to-Ground, Line-to-Line, Double line-to-Ground, Unbalanced

February
04 – Feb 25 Causes of Arc Flash
- Human Error; Example, Dropping of Tools or Parts
- Equipment Problem; Bolted Short Circuit and Arcing Short Circuit
Arc Flash Standards
- Regulation and Standards, OSHA Requirement/Practice, NFPA 70E Standard
  National Electric Safety Code

February 25  1ST HOURLY TEST

February
25 – March 11 Arc Flash Calculations
Arc flash equations: arcing fault current, incident energy, arc flash boundary, default values, Understanding Time curves
- NFPA 70E – 2000 (Annex D) < 1000 V; Flash Boundary Distance
- IEEE 1584 – 2011 Guide for Performing Arc Flash Hazard Calculations; Arc Fault, Incident Energy, Arc Flash Boundary, Valid Ranges (208 V to 15 kV, 700 A to 106 kA, Gap 13 mm to 153 mm), Out of Range (> 15 kV Use Ralph Lee Equations)
- DC Arc Flash Calculation;
- Current Limiting Tools, - Duration of Arc

March
18 – 25 Computer Arc Flash Calculations
- Collect Characteristics and Data Needed: All Protective Devices and Equipment
- Short Circuit Analysis, Operating Conditions, Range of Arc Current, Arcing Time, Arcing Range, Incident Energy

April
1 – April 15 Equipment Issues: Review to Reduce Arc Flash Levels – Fuse, Circuit Breakers, Switchgear, Meaningful Data Collection, Labels, Safety Concerns
Personal Protection Equipment (PPE): NFPA 70E

April 15  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 ETAP & Paladin. ETAP will be provided by the Department of Electrical and Computer Engineering. The university has one-sit for Paladin and will contact maintenance 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.