A. **Academic Division:** Business, Industry, and Technology

B. **Discipline:** Electronic Engineering Technology

C. **Course Number and Title:** ELET2570 Microcontrollers

D. **Course Coordinator:** Randy Storms
   **Assistant Dean:** Daniel Wagner

**Instructor Information:**
- **Name:** Click here to enter text.
- **Office Location:** Click here to enter text.
- **Office Hours:** Click here to enter text.
- **Phone Number:** Click here to enter text.
- **E-Mail Address:** Click here to enter text.

E. **Credit Hours:** 4
   - Lecture: 3 hours
   - Laboratory: 2 hours

F. **Prerequisites:** ELET1530

G. **Syllabus Effective Date:** Fall, 2017

H. **Textbook(s) Title:** None

I. **Workbook(s) and/or Lab Manual:** None

J. **Course Description:** This course is an exploration of the fascinating world of microcontrollers. The student will learn to program and interface the microcontroller using a variety of real-world applications. These applications will include discrete I/O operations, motor and machine control, environmental sensing and analog measurements. Other projects will involve interfacing to LCD displays, extending I/O, generating sounds and controlling AC appliances. The student will complete the course by designing, building, testing, and troubleshooting a microcontroller consumer application.

K. **College-Wide Learning Outcomes**

<table>
<thead>
<tr>
<th>College-Wide Learning Outcome</th>
<th>Assessments - - How it is met &amp; When it is met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication – Written</td>
<td>Final project includes an extensive report that will not only be graded for content, but will be assessed using the WAC rubric.</td>
</tr>
<tr>
<td>Communication – Speech</td>
<td></td>
</tr>
<tr>
<td>Intercultural Knowledge and Competence</td>
<td></td>
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<tr>
<td>Critical Thinking</td>
<td></td>
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<tr>
<td>Information Literacy</td>
<td></td>
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<tr>
<td>Quantitative Literacy</td>
<td></td>
</tr>
</tbody>
</table>

Updated: 2/14/2017
L. Course Outcomes and Assessment Methods:

Upon successful completion of this course, the student shall:

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Assessments – How it is met &amp; When it is met</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Describe the technical specifications of the microcontroller required</td>
<td>Labs 1-3, and quizzes 1-3 Weeks 1-3, the midterm, final and final project.</td>
</tr>
<tr>
<td>for the application</td>
<td></td>
</tr>
<tr>
<td>2. Describe the microcontroller, its functions and some of its basic</td>
<td>Homework for week 3 &amp; 4 quizzes 3 &amp; 4, weeks 3 &amp; 4, the midterm, final and final project.</td>
</tr>
<tr>
<td>applications.</td>
<td></td>
</tr>
<tr>
<td>3. Develop, compile and download programs into a microcontroller.</td>
<td>Labs 4-20, weeks 4-15, and quizzes 4-7, weeks 4-7, the midterm, final and final project.</td>
</tr>
<tr>
<td>4. Design interfaces to a variety of real world sensors and loads.</td>
<td>Labs 6, 15-20 and quizzes 6, 13, the midterm, final and final project.</td>
</tr>
<tr>
<td>5. Debug programming errors</td>
<td>Weekly Labs and quizzes throughout the semester and the midterm, final and final project.</td>
</tr>
<tr>
<td>6. Create programming solutions using Boolean logic and flowcharts</td>
<td>Weekly Labs and quizzes throughout the semester and the midterm, final and final project.</td>
</tr>
<tr>
<td>7. Use variables, identifiers, labels, aliases and arrays.</td>
<td>Weekly Labs starting week 6 quizzes 7-15, the midterm, final and final project.</td>
</tr>
<tr>
<td>8. Calculate and measure power requirements for any application.</td>
<td>Labs 1-3, 14-16, quizzes 4 &amp; 13, the midterm, final and final project.</td>
</tr>
<tr>
<td>9. Input, interpret, store and output analog data.</td>
<td>Lab 14 and the final exam</td>
</tr>
<tr>
<td>application.</td>
<td></td>
</tr>
</tbody>
</table>

M. Topical Timeline (Subject to Change):

- Specifications of a microcontroller
  - What it is.
  - Microcontroller used
  - EEPROM and RAM organization.
  - Operating speeds and instruction execution times.
  - Pinout and I/O assignments
  - PC interface
  - Power requirements
- Language Reference
  - Structures
    - Control Structures
    - Syntax
    - Arithmetic Operators
    - Comparison Operators
    - Boolean Operators
    - Pointer Access Operators
    - Compound Operators
  - Variables
    - Constants
    - Date Types
    - Conversion
    - Scope and Qualifiers
    - Utilities
- Functions
- Digital I/O
- Analog I/O
- Due only
- Advanced I/O
- Time
- Bits and Bytes
- External and internal interrupts
- USB

- Instruction Set
  - Program Setup Recommendations
    - Structured programming and flowcharting
    - Documentation
    - Naming conventions
    - I/O pinout assignments
    - Program presentation
  - Hardware interfacing
    - Discrete I/O
    - TTL circuitry
    - CMOS circuitry
    - Optical isolation
    - Inductive loads
    - PM DC motor
    - Servo and Stepper motors
    - AC motors
    - Communication links
    - Memory
    - LCD readouts

N. **Course Assignments:**

1. Weekly labs
2. Reading assignments
3. Homework assignments and labs
4. Quizzes

O. **Recommended Grading Scale:**

<table>
<thead>
<tr>
<th>NUMERIC</th>
<th>GRADE</th>
<th>POINTS</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>93–100</td>
<td>A</td>
<td>4.00</td>
<td>Superior</td>
</tr>
<tr>
<td>90–92</td>
<td>A-</td>
<td>3.67</td>
<td>Superior</td>
</tr>
<tr>
<td>87–89</td>
<td>B+</td>
<td>3.33</td>
<td>Above Average</td>
</tr>
<tr>
<td>83–86</td>
<td>B</td>
<td>3.00</td>
<td>Above Average</td>
</tr>
<tr>
<td>80–82</td>
<td>B-</td>
<td>2.67</td>
<td>Above Average</td>
</tr>
<tr>
<td>77–79</td>
<td>C+</td>
<td>2.33</td>
<td>Average</td>
</tr>
<tr>
<td>73–76</td>
<td>C</td>
<td>2.00</td>
<td>Average</td>
</tr>
<tr>
<td>70–72</td>
<td>C-</td>
<td>1.67</td>
<td>Below Average</td>
</tr>
<tr>
<td>67–69</td>
<td>D+</td>
<td>1.33</td>
<td>Below Average</td>
</tr>
<tr>
<td>63–66</td>
<td>D</td>
<td>1.00</td>
<td>Below Average</td>
</tr>
<tr>
<td>60–62</td>
<td>D-</td>
<td>0.67</td>
<td>Poor</td>
</tr>
<tr>
<td>00-59</td>
<td>F</td>
<td>0.00</td>
<td>Failure</td>
</tr>
</tbody>
</table>
P. Grading and Testing Guidelines:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online quizzes</td>
<td>30%</td>
</tr>
<tr>
<td>Labs</td>
<td>30%</td>
</tr>
<tr>
<td>Graded Homework</td>
<td>10%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>15%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Q. Examination Policy:

Both the Midterm and Final exam must be taken on or before the due dates of weeks 7 and 15. *No makeup times will be allowed!!!*

*If you miss the Midterm exam your Final exam score will be counted as worth 30% of your grade instead of 15%.*

R. Class Attendance and Homework Make-Up Policy:

This is a 4 Credit/5 contact hour course. You would normally be expected to attend 5 hours of in class. In addition, our Ohio Board of Regents expects us (the faculty) to assign a minimum of 2 hours homework per Credit hour of class. Add it all up and you will need to plan on 12-13 hours a week working on these class assignments.

S. Classroom Expectations:

Everyone is expected to be courteous to fellow students and their instructors at all times. Disruptive behavior cannot be tolerated for the sake of all students. Your instructor determines what disruptive behavior is.

T. College Procedures/Policies:

Attendance Requirements: All students are required to attend all scheduled classes and examinations. Each faculty member has the right to establish regulations regarding attendance that he/she considers necessary for successful study.

Students who do not attend classes may be administratively withdrawn from those classes. However, failure to attend classes does not constitute withdrawal, and students are expected to process a formal withdrawal through the Student Records Office in Kee Hall.

Student engagement requirements:
Student engagement is based on the “active pursuit” of learning which can be measured by class attendance, class participation (in class or online), taking required quizzes/examinations, and submission of work assignments or papers. Student engagement consists of a student attending at least 60% of the class sessions (there should be attendance throughout the term) and/or completing 75% of the assignments listed on the syllabus at the midpoint in the term. Exceptions can be made when there is on-going communication between the student and faculty member. The communication must be documented and the faculty member and student must be in agreement regarding the exception. Students not meeting the expectation will be administratively withdrawn from class. If a student believes he/she was administratively withdrawn in error, he/she may file an appeal. Being administratively withdrawn may have program and financial aid implications.

**Academic Misconduct** is any activity that tends to compromise the academic integrity of the college, or subvert the educational process. Examples of academic misconduct include, but are not limited to:
1. **Violation of course or program rules** as contained in the course syllabus or other information provided to the student; violation of program requirements as established by departments and made available to students.

2. **Plagiarism** including, but not limited to, submitting, without appropriate acknowledgment, any written, visual or oral material that has been copied in whole or in part from the work of others (whether such source is published or not) even if the material is completely paraphrased in one’s own words. This includes another individual’s academic composition, compilation, or other product, or a commercially prepared paper. Plagiarism also includes submitting work in which portions were substantially produced by someone acting as a tutor or editor.

   Such practices constitute plagiarism regardless of motive. Those who deny deceitful intent, claim not to have known that the act constituted plagiarism, or maintain that what they did was inadvertent are nevertheless subject to penalties when plagiarism has been confirmed.

3. **Cheating** and dishonest practices in connection with examinations, papers and projects, including but not limited to using unauthorized notes, study aids or information on an examination; obtaining help from another student during an examination; taking an exam or doing work for another student; providing one’s own work for another student to copy and submit as his/her own; or allowing another student to do one’s work and then submitting the work as one’s own. Also included would be altering a graded work after it has been returned, then submitting the work for re-grading; or submitting identical or similar papers for credit in more than one course without prior permission from the course instructors.

4. **Fabrication** including but not limited to falsifying or inventing any information, data or citation; presenting data that were not gathered in accordance with defined appropriate guidelines, and failing to include an accurate account of the method by which data were collected.

5. **Obtaining an Unfair Advantage** including, but not limited to stealing, reproducing, circulating, or otherwise gaining access to examination materials prior to the time authorized by the instructor; unauthorized collaborating on an academic assignment; taking, hiding or altering resource material; or undertaking any activity with the purpose of creating or obtaining an unfair advantage over another student’s academic work.

6. **Aiding and Abetting Academic Dishonesty** including, but not limited to providing material, information or other assistance to another person with the knowledge that such aid could be used in any of the violations stated above, or providing false information in connection with any inquiry regarding academic integrity.

7. **Alteration of Grades or Marks** including but not limited to, action by the student in an effort to change the earned credit or grade.

   In addition, cases of academic dishonesty may involve photocopied materials. Materials used may fall under the Copyright Act. Violations of said Act may subject the user and/or the College to sanctions.

**Statement on Disabilities:** Any student who requires reasonable accommodations related to a disability should inform the course instructor and the Coordinator of Specialized Services (Room 138 in Kee Hall; phone 419-755-4727).

   Students who encounter difficulty in any of their courses are encouraged to visit the Tutoring Resource Center (Room 119 in Fallerius Technical Education Center) for tutoring assistance, and the Student Success Center (Room 136 in Kee Hall) for academic assistance, advising services, referrals for personal counseling and Learning Disability (LD) Testing.

**Statement on Withdrawals:** As a student, you are expected to attend class. If you are unable or choose not to attend class, or if for whatever reason you are unable to keep up with the requirements of a course, you
need to officially drop the class at the Student Records Office. Refund dates and withdrawal dates will vary slightly from term to term. Contact the Student Records Office for applicable dates. Additionally these dates are posted on the academic calendar available on the college’s website, www.ncstatecollege.edu, under the Academics heading on the home page and are available at the Student Records Office in Kee Hall. Students should go to the Student Records Office (Room 142 in Kee Hall) to process their withdrawal from any class.

If you choose to walk away from your class without officially withdrawing from it, the faculty member teaching the class must grade your classroom performance on the material available to him or her. This normally results in an "F" grade. An "F" grade can lower your grade point average considerably depending on the total credits accumulated.