1. General Information

1a. Submitted by the College of: ENGINEERING

  Date Submitted: 10/7/2015

1b. Department/Division: Electrical and Computer Engineering

1c. Contact Person

  Name: James Lumpp

  Email: jel@uky.edu

  Phone: 7-3895

  Responsible Faculty ID (if different from Contact)

  Name:

  Email:

  Phone:

1d. Requested Effective Date: Semester following approval

1e. Should this course be a UK Core Course? No

2. Designation and Description of Proposed Course

2a. Will this course also be offered through Distance Learning?: No

2b. Prefix and Number: EE 287

2c. Full Title: Introduction to Embedded Systems

2d. Transcript Title:

2e. Cross-listing: CPE 287

2f. Meeting Patterns

  LECTURE: 3

  LABORATORY: 3

2g. Grading System: Letter (A, B, C, etc.)

2h. Number of credit hours: 4

2i. Is this course repeatable for additional credit? No

  If Yes: Maximum number of credit hours:

  If Yes: Will this course allow multiple registrations during the same semester?

2j. Course Description for Bulletin: Introduction to Embedded Systems teaches students how to use microcontrollers to interact with the physical world. Lectures will cover the theory behind microcontroller architecture, programming, and interfacing and lab projects will back up that theory with hands-on design experiments using microcontrollers. Topics include assembly language and high-level language programming, address decoding, hardware interrupts, parallel and serial interfacing, analog I/O, and basic real-time processing.

2k. Prerequisites, if any: Prereq: EE/CpE 282 and Prereq or Concur: CS215 or consent of instructor.

2l. Supplementary Teaching Component:

3. Will this course taught off campus?   No

   If YES, enter the off campus address:

4. Frequency of Course Offering: Spring,

   Will the course be offered every year?:   Yes

   If No, explain:

5. Are facilities and personnel necessary for the proposed new course available?:   Yes

   If No, explain:

6. What enrollment (per section per semester) may reasonably be expected?: 50

7. Anticipated Student Demand

   Will this course serve students primarily within the degree program?:   Yes

   Will it be of interest to a significant number of students outside the degree pgm?:   No

   If Yes, explain:

8. Check the category most applicable to this course: Traditional – Offered in Corresponding Departments at Universities Elsewhere,

   If No, explain:

9. Course Relationship to Program(s).

   a. Is this course part of a proposed new program?:   No

   If YES, name the proposed new program:

   b. Will this course be a new requirement for ANY program?:   Yes

   If YES, list affected programs: Required for the BSEE and BSCOE degrees

10. Information to be Placed on Syllabus.

   a. Is the course 400G or 500?:   No

   b. The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500-level grading differentiation if applicable, from **10.a** above) are attached: Yes

Distance Learning Form

Instructor Name:

Instructor Email:

Internet/Web-based: No

Interactive Video: No

Hybrid: No

1. How does this course provide for timely and appropriate interaction between students and faculty and among students? Does the course syllabus conform to University Senate Syllabus Guidelines, specifically the Distance Learning Considerations?

2. How do you ensure that the experience for a DL student is comparable to that of a classroom-based student's experience? Aspects to explore: textbooks, course goals, assessment of student learning outcomes, etc.

3. How is the integrity of student work ensured? Please speak to aspects such as password-protected course portals, proctors for exams at interactive video sites; academic offense policy; etc.

4. Will offering this course via DL result in at least 25% or at least 50% (based on total credit hours required for completion) of a degree program being offered via any form of DL, as defined above?

If yes, which percentage, and which program(s)?

5. How are students taking the course via DL assured of equivalent access to student services, similar to that of a student taking the class in a traditional classroom setting?

6. How do course requirements ensure that students make appropriate use of learning resources?

7. Please explain specifically how access is provided to laboratories, facilities, and equipment appropriate to the course or program.

8. How are students informed of procedures for resolving technical complaints? Does the syllabus list the entities available to offer technical help with the delivery and/or receipt of the course, such as the Information Technology Customer Service Center (http://www.uky.edu/UKIT/)?

9. Will the course be delivered via services available through the Distance Learning Program (DLP) and the Academic Technology Group (ATL)? NO

If no, explain how student enrolled in DL courses are able to use the technology employed, as well as how students will be provided with assistance in using said technology.

10. Does the syllabus contain all the required components? NO

11. I, the instructor of record, have read and understood all of the university-level statements regarding DL.

Instructor Name:

SIGNATURE|HOLLOWAY|Lawrence E Holloway|EE 287 NEW Dept Review|20151008

SIGNATURE|BJSTOK0|Barbara J Brandenburg|EE 287 NEW College Review|20151022

SIGNATURE|JMETT2|Joanie Ett-Mims|EE 287 NEW Undergrad Council Review|20151216

New Course Form

https://myuk.uky.edu/sap/bc/soap/rfc?services=

Open in full window to print or save

Attachments:

Browse...   **Upload File**

ID	Attachment
Delete 6005	EE287syllabusV3.pdf

First 1 Last

(*denotes required fields)

1. **General Information**

   a. * Submitted by the College of: ENGINEERING ▼   Submission Date: 10/7/2015

   b. * Department/Division: Electrical and Computer Engineering ▼

   c.

   * Contact Person Name: James Lumpp   Email: jel@uky.edu   Phone: 7-3895

   * Responsible Faculty ID (if different from Contact)   Email: Phone:

   d. * Requested Effective Date: ⦿ Semester following approval OR ◯ Specific Term/Year [1]

   e.

   Should this course be a UK Core Course? ◯ Yes ⦿ No

   If YES, check the areas that apply:

   ☐ Inquiry - Arts & Creativity   ☐ Composition & Communications - II

   ☐ Inquiry - Humanities   ☐ Quantitative Foundations

   ☐ Inquiry - Nat/Math/Phys Sci   ☐ Statistical Inferential Reasoning

   ☐ Inquiry - Social Sciences   ☐ U.S. Citizenship, Community, Diversity

   ☐ Composition & Communications - I ☐ Global Dynamics

2. **Designation and Description of Proposed Course.**

   a. * Will this course also be offered through Distance Learning? ◯ Yes [4] ⦿ No

   b. * Prefix and Number: EE 287

   c. * Full Title: Introduction to Embedded Systems

   d. Transcript Title (if full title is more than 40 characters):

   e. To be Cross-Listed [2] with (Prefix and Number): CPE 287

   f. * Courses must be described by at least one of the meeting patterns below. Include number of actual contact hours[3] for each meeting pattern type.

3	Lecture	3	Laboratory[1]		Recitation		Discussion
	Indep. Study		Clinical		Colloquium		Practicum
	Research		Residency		Seminar		Studio
	Other	If Other, Please explain:					

   g. * Identify a grading system:
   ⦿ Letter (A, B, C, etc.)
   ◯ Pass/Fail
   ◯ Medicine Numeric Grade (Non-medical students will receive a letter grade)
   ◯ Graduate School Grade Scale

   h. * Number of credits: 4

   i. * Is this course repeatable for additional credit?   ◯ Yes ⦿ No
   If YES: Maximum number of credit hours:
   If YES: Will this course allow multiple registrations during the same semester? ◯ Yes ◯ No

j. * Course Description for Bulletin:

Introduction to Embedded Systems teaches students how to use microcontrollers to interact with the physical world. Lectures will cover the theory behind microcontroller architecture, programming, and interfacing and lab projects will back up that theory with hands-on design experiments using microcontrollers. Topics include assembly language and high-level language programming, address decoding, hardware interrupts, parallel and serial interfacing, analog I/O, and basic real-time processing.

k. Prerequisites, if any:

Prereq: EE/CpE 282 and Prereq or Concur: CS215 or consent of instructor.

l. Supplementary teaching component, if any: ○ Community-Based Experience ○ Service Learning ○ Both

3. * Will this course be taught off campus?   ○ Yes ◉ No

   If YES, enter the off campus address:

4. Frequency of Course Offering.

   a. * Course will be offered (check all that apply):   ☑ Fall   ☑ Spring   ☐ Summer   ☐ Winter

   b. * Will the course be offered every year?   ◉ Yes ○ No

      If No, explain:

5. * Are facilities and personnel necessary for the proposed new course available?   ◉ Yes ○ No

   If No, explain:

6. * What enrollment (per section per semester) may reasonably be expected?   50

7. Anticipated Student Demand.

   a. * Will this course serve students primarily within the degree program?   ◉ Yes ○ No

   b. * Will it be of interest to a significant number of students outside the degree pgm?   ○ Yes ◉ No

      If YES, explain:

8. * Check the category most applicable to this course:

   ☑ Traditional – Offered in Corresponding Departments at Universities Elsewhere
   ☐ Relatively New – Now Being Widely Established
   ☐ Not Yet Found in Many (or Any) Other Universities

9. Course Relationship to Program(s).

   a. * Is this course part of a proposed new program?   ○ Yes ◉ No

      If YES, name the proposed new program:

   b. * Will this course be a new requirement [5] for ANY program?   ◉ Yes ○ No

      If YES [5], list affected programs::

      Required for the BSEE and BSCOE degrees

10. Information to be Placed on Syllabus.

    a. * Is the course 400G or 500?   ○ Yes ◉ No

       If YES, the *differentiation for undergraduate and graduate students must be included* in the information required in 10.b. You must include: (i) identi additional assignments by the graduate students; and/or (ii) establishment of different grading criteria in the course for graduate students. (See SR

    b. ☑ * The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500-level grading differentiation if appl

       10.a above) are attached.

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[1] Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.
[2] The chair of the cross-listing department must sign off on the Signature Routing Log.

[1] In general, undergraduate courses are developed on the principle that one semester hour of credit represents one hour of classroom meeting per week for a semester, exclusive of any laboratory meeting. Laboratory meeting, generally, re two hours per week for a semester for one credit hour. (from SR 5.2.1)
[2] You must also submit the Distance Learning Form in order for the proposed course to be considered for DL delivery.
[3] In order to change a program, a program change form must also be submitted.

Rev 8/09

EE 287
Introduction to Embedded Systems

Instructor:	Dr. James Lumpp
Office Address:	467C F. Paul Anderson Tower, 0046
Email:	jel@uky.edu (preferred method of contact)
Office Phone:	257-3895
Office hours:	Monday and Wednesday, 2 to 3:30 PM
Lecture:	MWF 9-9:50AM, 267FPAT
Lab Sections (581FPAT)	
001:	W 2-5PM
002:	F 2-5PM

Course Description: Introduction to Embedded Systems teaches students how to use microcontrollers to interact with the physical world. Lectures will cover the theory behind microcontroller architecture, programming, and interfacing and lab projects will back up that theory with hands-on design experiments using microcontrollers. Topics include assembly language and high-level language programming, address decoding, hardware interrupts, parallel and serial interfacing, analog I/O, and basic real-time processing.

Prerequisites: Prerequisite: EE/CpE 282, Prerequisite or Concurrent: CS215, or consent of instructor.

Student Learning Outcomes:

> Students who fulfill the requirements for this course will be able to:
> 1. design and implement a simple computer controlled devices.
> 2. write programs for a microprocessor in assembly language.
> 3. interface microprocessors to a variety of devices.
> 4. analyze and debug systems built around microcontrollers.
> 5. develop embedded systems controlled by modern microcontrollers and evaluate the capabilities and limitations of such systems.

Required Materials:

Embedded Systems: Introduction to Arm® Cortex(TM)-M Microcontrollers , Fifth Edition, 5th Edition, by Jonathan W Valvano, 2013, ISBN-13: 978-1477508992, ISBN-10: 1477508996

Lab Supplies: Microcontroller Development Kit: Tiva™ C Series LaunchPad Evaluation Kit (EK-TM4C123GXL).

A personal computer capable of running software available through UK Downloads and freeware software specified by the instructor.

Description of Course Activities and Assignments
Course Assignments
Homework, quizzes, lab and project reports will be submitted and graded via Canvas.

Midterm exams will be given in class and the final exam will be given during finals week.

Lab Experiments:	20%	6 Design Experiments, 50 points each
Homework:	10%	10 homework assignments, 20 points each
Quizzes:	10%	10 In-Class Quizzes, 20 points each
Exam 1:	20%	100 points
Exam 2:	20%	100 points
Final Exam:	20%	Comprehensive Final, 100 points

Summary Description of Course Assignments

Homework Problems, Lab Design Problems, and Quizzes will evaluate student's knowledge of embedded computing concepts. The first mid-term exam will evaluate student's understanding of microcontroller architecture and assembly programming. The second mid-term exam will evaluate student's understanding of microcontroller interfacing. The final exam will be comprehensive.

Course Grading

Grading Scale
    90 – 100% = A
    80 – 89% = B
    70 – 79% = C
    60 – 69% = D
    < 60% = E

Tentative Course Schedule

Q = weekly quiz on reading and technical content
E = exam
HW = homework problems, drawings, calculations, etc
L = Laboratory Experiment

Week	Topics	Assignments
1	Welcome, Review Syllabus, Introduction to Canvas, Logic and Number Systems Review	Q1 HW1
2	Lab Policies, the ARM architecture, IDE and Development boards	L1
3	Basic Processor Architecture	Q2 HW2
4	Assembly Codes and Machine Codes	HW3
5	Control Flow and Assembly Programming	L2 Q3 HW4
6	Memory Mapping, Bit Banding	E1 HW5
7	GPIO Ports and Addressing	HW6 Q4
8	Embedded C Programming	L3 Q5
9	Synchronous and Asynchronous Serial I/O (UART, SPI, I2C)	HW7 Q6
10	Embedded Peripherals	HW8 Q7
11	Interrupts and Concurrency	E2
12	Analog to Digital Conversion, Digital to Analog Conversion, Digital Signal Processing	L4 Q8
13	User Interface Design	HW9
14	Real-Time Operating Systems	Q9
15	Advanced Topics (Embedded Networking)	L5 Q10
16	Advanced Topics (Wireless, LCDs)	L6 HW10
Finals	Final Exam	E3

Final Exam Information

The final Exam will be Tuesday May 6, 2016 in FPAT 263.

Mid-term Grade

Mid-term grades will be posted in myUK by the deadline established in the Academic Calendar (http://www.uky.edu/registrar/content/academic-calendar)

Course Policies:

Submission of Assignments:

UK Canvas (uk.instructure.com) will be used for posting class announcements and assignments. Use your Link Blue login and password to access Canvas based courses. Canvas is also accessible through a smartphone app. Students are responsible for regularly checking the class Canvas site and checking email.

Attendance Policy:

Attendance may be taken at all class and lab meetings. Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused or unexcused) per university policy.

Excused Absences (boilerplate)

Students need to notify the professor of absences prior to class when possible. *Senate Rules 5.2.4.2* defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit "reasonable cause for nonattendance" by the professor.

Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class. Two weeks prior to the absence is reasonable, but should not be given any later. Information regarding major religious holidays may be obtained through the Ombud (859-257-3737, http://www.uky.edu/Ombud/ForStudents_ExcusedAbsences.php.

Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused) per University policy.

Per *Senate Rule 5.2.4.2*, students missing any graded work due to an excused absence are responsible: for informing the Instructor of Record about their excused absence within one week following the period of the excused absence (except where prior notification is required); and for making up the missed work. The professor must give the student an opportunity to make up the work and/or the exams missed due to an excused absence, and shall do so, if feasible, during the semester in which the absence occurred.

Verification of Absences

Students may be asked to verify their absences in order for them to be considered excused. *Senate Rule 5.2.4.2* states that faculty have the right to request "appropriate verification" when students claim an excused absence because of illness, or death in the family. Appropriate notification of absences due to University-related trips is required prior to the absence when feasible and in no case more than one week after the absence.

Academic Integrity

Per University policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the University may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: http://www.uky.edu/Ombud. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.

Senate Rules 6.3.1 (see http://www.uky.edu/Faculty/Senate/ for the current set of *Senate Rules*) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about a question of plagiarism involving their work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording, or content from another source without appropriate acknowledgment of the fact, the students are guilty of plagiarism.

Plagiarism includes reproducing someone else's work (including, but not limited to a published article, a book, a website, computer code, or a paper from a friend) without clear attribution. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work, which a student submits as his/her own, whoever that other person may be. Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone.

When a student's assignment involves research in outside sources or information, the student must carefully acknowledge exactly what, where and how he/she has employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content, and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas, which are so generally and freely circulated as to be a part of the public domain.

Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

Accommodations due to disability
If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (DRC). The DRC coordinates campus disability services available to students with disabilities. It is located on the corner of Rose Street and Huguelet Drive in the Multidisciplinary Science Building, Suite 407. You can reach them via phone at (859) 257-2754 and via email at drc@uky.edu. Their web address is http://www.uky.edu/StudentAffairs/DisabilityResourceCenter/.