### ATTACHMENT 2 (e)

### Course Specifications

**Kingdom of Saudi Arabia**

**The National Commission for Academic Accreditation & Assessment**

**Course Specifications**

**(CS)**

**Course Specifications**

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| Institution: **King Saud University** Date of Report: **18/12/2013** |
| College/Department :  **College of Computer and Information Sciences/Department of Computer Engineering** |

**A. Course Identification and General Information**

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| 1. Course title and code: **Digital System Design Lab, CEN434** |
| 2. Credit hours **2 (0, 4, 0) (lecture, lab, tutorial)** |
| 3. Program(s) in which the course is offered.  (If general elective available in many programs indicate this rather than list programs)  **BSc in Computer Engineering** |
| 4. Name of faculty member responsible for the course  **Dr. Esa Alghonaim and Eng. Mohammed Hourani** |
| 5. Level/year at which this course is offered **Level: 9-10** |
| 6. Pre-requisites for this course (if any)  **CEN439** |
| 7. Co-requisites for this course (if any)  **N/A** |
| 8. Location if not on main campus  **N/A** |
| 9. Mode of Instruction (mark all that apply)  a. Traditional classroom What percentage?  b. Blended (traditional and online) What percentage?  c. e-learning What percentage?  d. Correspondence What percentage?  f. Other **Lab** What percentage? **100%**  Comments: |

**B Objectives**

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| 1. What is the main purpose for this course?  **After completing this lab course, students will be able to apply their knowledge and skills in programming and digital design techniques to implement embedded systems designs.**  **In particular, students will learn how to conduct engineering experiments, as well as analyze and interpret data, develop an ability to communicate effectively in writing and to convey technical material, write functionally correct and well-documented code, interface a given technology device (such as memory) to the system and interface and program input/output such as keypad and LCD module.** |
| 2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)  **This lab by itself is a new developed course. We previously taught microprocessor lab, then we replaced the experiments of that lab from microprocessors to microcontrollers in order to be concurrent with the recently introduced embedded systems course.** |

**C. Course Description (Note: General description in the form to be used for the Bulletin or handbook should be attached)**

**This lab course includes several experiments that are related to latest embedded systems technology. The experiments include: Logic analyzer investigation, writing C code and debugging it using the simulator and the emulator, Timers, Interrupts, Serial EEPROM memory interface and programming, LCD module interface and programming, Keypad interface and programming, Serial communication and Analog-Digital module . The experiments are based on PIC24H processors.**

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| 1. Topics to be Covered | | |
| List of Topics | No. of  Weeks | Contact Hours |
| **Lab introduction** | **1** | **4** |
| **Introduction to development system** | **1** | **4** |
| **ICD3 and Clock configuration** | **1** | **4** |
| **LCD module** | **2** | **8** |
| **Timers and Interrupts** | **2** | **8** |
| **AD Module** | **2** | **8** |
| **SPI and EEPROM** | **1** | **4** |
| **Keypad** | **1** | **4** |
| **PWM and Relay** | **1** | **4** |

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| 2. Course components (total contact hours and credits per semester): | | | | | | |
|  | Lecture | Tutorial | Laboratory | Practical | Other: | Total |
| Contact  Hours | **n/a** | **n/a** | **60** |  |  | **60** |
| Credit | **n/a** | **n/a** | **2** |  |  | **2** |

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| 3. Additional private study/learning hours expected for students per week. **2 hrs** |

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| 4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy |

Course Learning Outcomes, Assessment Methods, and Teaching Strategy work together and are aligned. They are joined together as one, coherent, unity that collectively articulate a consistent agreement between student learning, assessment, and teaching.

The ***National Qualification Framework*** provides five learning domains. Course learning outcomes are required. Normally a course has should not exceed eight learning outcomes which align with one or more of the five learning domains. Some courses have one or more program learning outcomes integrated into the course learning outcomes to demonstrate program learning outcome alignment. The program learning outcome matrix map identifies which program learning outcomes are incorporated into specific courses.

On the table below are the five NQF Learning Domains, numbered in the left column.

**First**, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. **Fourth**, if any program learning outcomes are included in the course learning outcomes, place the @ symbol next to it.

Every course **is not required** to include learning outcomes from each domain.

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|  | **NQF Learning Domains**  **And Course Learning Outcomes** | **Course Teaching**  **Strategies** | **Course Assessment**  **Methods** |
| **1.0** | **Knowledge** | | |
| 1.1 | **Ability to analyse and interface embedded systems.** | **Lab Discussion** | **Oral test after each experiment, two written exams** |
| 1.2 | **Ability to identify, formulate analyze and solve embedded systems problems.** | **Lab Discussion** | **Oral test after each experiment, two written exams** |
| **2.0** | **Cognitive Skills** | | |
| 2.1 | **The ability to configure and use popular microcontroller peripherals, such as: clock module, interrupt module, communication module, timer module and A/D module.** | **Lab Experiments using real PCB boards.** | **Oral test at the end of the experiment, report and exams.** |
| 2.2 | **The ability to identify and analyze hardware problem in an embedded system PCB board.** | **Lab Experiments using real PCB boards.** | **Oral test at the end of the experiment, report and exams.** |
| 2.3 | **Be able to pursue future professional development activities related to embedded systems.** | **Performing lab experiments related to real word problems.** | **Oral test at the end of the experiment, report and exams.** |
| **3.0** | **Interpersonal Skills & Responsibility** | | |
| 3.1 | **Be able to work in a team** | **Students are divided into teams of two students each.** | **Oral test at the end of each experiment** |
| **4.0** | **Communication, Information Technology, Numerical** | | |
| 4.1 |  |  |  |
| **5.0** | **Psychomotor** | | |
| 5.1 | **Ability to build a PCB board through wire wrapping and use lab equipment such as: logic analyzer, voltmeter, logic probe and PC.** | **Each experiment requires doing PCB connections using wire wrapping** | **Oral test at the end of each experiment** |

**Suggested Guidelines for Learning Outcome Verb, Assessment, and Teaching**

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| **NQF Learning Domains** | **Suggested Verbs** |
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| **Knowledge** | list, name, record, define, label, outline, state, describe, recall, memorize, reproduce, recognize, record, tell, write |
| **Cognitive Skills** | estimate, explain, summarize, write, compare, contrast, diagram, subdivide, differentiate, criticize, calculate, analyze, compose, develop, create, prepare, reconstruct, reorganize, summarize, explain, predict, justify, rate, evaluate, plan, design, measure, judge, justify, interpret, appraise |
| **Interpersonal Skills & Responsibility** | demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write |
| **Communication, Information**  **Technology, Numerical** | demonstrate, calculate, illustrate, interpret, research, question, operate, appraise, evaluate, assess, and criticize |
| **Psychomotor** | demonstrate, show, illustrate, perform, dramatize, employ, manipulate, operate, prepare, produce, draw, diagram, examine, construct, assemble, experiment, and reconstruct |

Suggested ***verbs not to use*** when writing measurable and assessable learning outcomes are as follows:

Consider Maximize Continue Review Ensure Enlarge Understand

Maintain Reflect Examine Strengthen Explore Encourage Deepen

Some of these verbs can be used if tied to specific actions or quantification.

**Suggested assessment methods and teaching strategies are:**

According to research and best practices, multiple and continuous assessment methods are required to verify student learning. Current trends incorporate a wide range of rubric assessment tools; including web-based student performance systems that apply rubrics, benchmarks, KPIs, and analysis. Rubrics are especially helpful for qualitative evaluation. Differentiated assessment strategies include: exams, portfolios, long and short essays, log books, analytical reports, individual and group presentations, posters, journals, case studies, lab manuals, video analysis, group reports, lab reports, debates, speeches, learning logs, peer evaluations, self-evaluations, videos, graphs, dramatic performances, tables, demonstrations, graphic organizers, discussion forums, interviews, learning contracts, antidotal notes, artwork, KWL charts, and concept mapping.

Differentiated teaching strategies should be selected to align with the curriculum taught, the needs of students, and the intended learning outcomes. Teaching methods include: lecture, debate, small group work, whole group and small group discussion, research activities, lab demonstrations, projects, debates, role playing, case studies, guest speakers, memorization, humor, individual presentation, brainstorming, and a wide variety of hands-on student learning activities.

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| 5. Schedule of Assessment Tasks for Students During the Semester | | | |
|  | Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.) | Week Due | Proportion of Total Assessment |
| 1 | **Performance during the lab (attendance,** | **14 week** | **30%** |
| 2 | **Practical Final exam** | **14 week** | **20%** |
| 3 | **Performance evaluation** | **Weekly** | **10%** |
| 4 | **Attendance** | **Weekly** | **20%** |
| 5 | **Reports** | **Weekly** | **20%** |

**D. Student Academic Counseling and Support**

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| 1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)  **Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in the Lab: For this reason instructor provides at least 4 office hours per week.**  **My e-mail address is also used for any consultations during the vacations.** |

**E. Learning Resources**

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| 1. List Required Textbooks  **Robert B. Reese, J. W. Bruce, and Bryan A. Jones, ‘Microcontrollers: From Assembly Language to C Using the PIC24 Family’, 2008.** |
| 2. List Essential References Materials (Journals, Reports, etc.)  **Lecture Notes and data sheets** |
| 3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) |
| 4. List Electronic Materials (eg. Web Sites, Social Media, Blackboard, etc.)  **Datasheets and lecture notes in the course page in the blackboard system.** |
| 5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.  **MPALB software IDE for embedded systems development.**  **Logic analyser software tools.** |

**F. Facilities Required**

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| Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.) |
| 1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)   * **Lab with 28 seats** * **Smart Room (the lab is equipped with smart board)** |

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| 2. Computing resources (AV, data show, Smart Board, software, etc.)  **Lab with 15 PCS** |
| 3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) |

**G Course Evaluation and Improvement Processes**

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| 1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching  **Encouraging interaction with the students and giving them the opportunity to express themselves in matter related to the course.** |
| 2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor   * **Self-evaluation** * **Department evaluation** |
| 3 Processes for Improvement of Teaching   * **Attending university workshops on teaching improvement strategies.** * **Department evaluation;** * **Grades;** * **Periodical revision of the method of teaching and the course outcomes;** * **Review of annual course assessment** |
| 4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution)   * **Check marking by an independent faculty member of a sample of student work.** * **Follow accreditation requirement.** |

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| 5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.   1. **Student survey : Measures students feedback about the Lab.** 2. **Course Report: In each semester, identifies the strengths and weakness of the Lab and describe the issues that will be taken in the next semester.** |

**Faculty or Teaching Staff: Dr. Esa Alghonaim**

**Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date Report Completed: 5/12/2013**

**Received by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Dean/Department Head**

**Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**