Republic of the Philippines
**SULTAN KUDARAT STATE UNIVERSITY**
Isulan, Sultan Kudarat
**College of Computer Studies**
**SY 2022 - 2023**

## UNIVERSITY VISION

A trailblazer in arts, science and technology in the region.

## UNIVERSITY MISSION

The University shall primarily provide advance instruction and professional training in science and technology, agriculture, fisheries, education and other related field of study. It shall undertake research and extension services, and provide progressive leadership in its area of specialization.

## UNIVERSITY GOAL

To produce graduates with excellence and dignity in arts, science and technology.

## Program Objectives and its Relationship to University Objectives:

## UNIVERSITY OBJECTIVES

a. Enhance competency development, commitment, professionalism, unity and true spirit of service for public accountability, transparency and delivery of quality services;
b. Provide relevant programs and professional trainings that will respond to the development needs of the region;
c. Strengthen local and international collaborations and partnerships for borderless programs;
d. Develop a research culture among faculty and students;
e. Develop and promote environmentally-sound and market-driven knowledge and technologies at par with international standards;
f. Promote research-based information and technologies for sustainable development;
g. Enhance resource generation and mobilization to sustain financial viability of the university.

| PROGRAM OBJECTIVES (PO) | UNIVERSITY OBJECTIVES | | | | | | |
|---|---|---|---|---|---|---|---|
| A graduate of BS in Information Technology can: | a | b | c | d | E | f | g |
| a. innovate technological concepts and ideas underpinning desired IT solutions; | / | / | / | / | / | / | / |
| b. administer competently the computer networks, systems development, software applications, hardware and maintenance; | / | / | / | / | / | / | / |
| c. design industry-based applications, infrastructures and technologies that will promote the advancement and development of the community; | / | / | / | / | / | / | / |
| d. Adopt to various national and international industries standards in the practice of the profession; and | / | / | / | / | / | / | / |
| e. demonstrate professionalism in the social, environmental and legal aspects of information technology. | / | / | / | / | / | / | / |

**1. Course Code** : AT 324
**2. Course Title** : EMBEDDED SYSTEM
**3. Prerequisite** : AT 316 – DIGITAL DESIGN
**4. Credits** : 3 UNITS

**5. Course Description**:

The This course emphasizes on comprehensive treatment of embedded hardware and real time operating systems along with case studies, in tune with the requirements of Industry. The objective of this course is to enable the students to understand embedded-system programming and apply that knowledge to design and develop embedded solutions..

**6. Course Learning Outcomes and Relationships to Program Objectives**

| Course Learning Outcomes | Program Objectives | | | | |
|---|---|---|---|---|---|
| **At the end of the semester, the students can:** | a | b | c | d | e |
| a. Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions | / | / | / | / | / |
| b. familiarized with programming environment to develop embedded solutions | / | / | / | / | / |
| c. Understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices | / | / | / | / | / |
| d. Identify hardware and software components to build an embedded system. | / | / | / | / | / |
| e. Demonstrate the interfacing of peripherals with 8051/ARM microcontroller. | / | / | / | / | / |
| f. Program peripherals using arduino starter kit | / | / | / | / | / |
| g. Program robots using arduino uno r3 | / | / | / | / | / |
| h. Program ARM microcontroller to perform various tasks. | / | / | / | / | / |

## 7. Course Content

| Course Objectives, Topics, Time Allotment | Desired Student Learning Outcomes | Outcomes-Based Assessment (OBA) Activities | Evidence of Outcomes | Course Learning Outcomes | Program Objectives | Values Integration |
|---|---|---|---|---|---|---|
| **TOPIC 1: SKSU VMGO, CLASSROOM POLICIES, COURSE OVERVIEW, COURSE REQUIREMENTS, GRADING SYSTEM (1 hour)** | | | | | | |
| 1. Discuss the VMGO of the university, classroom and computer laboratory policies, scope of the course, course requirements and grading system | 1.1 Student can be aware of and appreciate of the university's VMGO, classroom and computer laboratory policies, course overview, requirements and grading system. | Individual participation by way of asking clarification on VMGO, classroom policies and requirements, and grading system if | Teacher-student interaction | j, k | d,e | Value of appreciation |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | deemed necessary | | | | |
| **TOPIC 2: Embedded System Introduction (19 hours)** | | | | | | |
| 2.1. Definition of Embedded System<br>2.2. History of Embedded System<br>2.3. Embedded System & General purpose computer<br>2.4. Classification of Embedded System<br>2.5. Application of Embedded System<br>2.6. Purpose of Embedded System | **Students can:**<br>2.3. Understand what is embedded system<br>2.4. Look at embedded systems from a historical point of view<br>2.5. Classify embedded systems<br>2.6. Look at certain application and purposes of embedded system. | | Assignments<br><br>Quizzes<br><br>Graded laboratory activities | a, b, c, d, k | d, e | Value of listening and appreciation<br><br>Value of exploration<br><br>Value of logical analysis |
| **TOPIC 3. Elements of Embedded System (12 hours)** | | | | | | |
| 3.1. Elements of Embedded System<br>• Case studies (Examples) Washing machine<br>• Micro2wave owen<br>• Automotive Embedded System | | Asynchronous discussions<br><br>Interactive discussions<br><br>Hands-on activities | Assignments<br><br>Quizzes<br><br>Graded laboratory | e, i, j, k | a, b, d | Value of listening and appreciation<br><br>Value of exploration |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Problem solving<br><br>Laboratory exercises | activities | | | Value of logical analysis |
| **TOPIC 4: Core of Embedded System(10 hour)** | | | | | | |
| 4.1. Core of Embedded System<br>4.2. General purpose and domain specific processors<br>• Microprocessors<br>• Microcontrollers<br>• Digital signal processor<br><br>4.3. Application Specific Integrated Circuits (ASIC)<br>4.4. Programmable logic devices (PLD's)<br>4.5. Commercial off-the-shelf components (COTs)<br>4.6. Sensors & Actuators<br>4.7. Communication Interfaces | The student can:<br>4.1. learn the concept of data | Asynchronous discussions<br><br>Interactive discussions<br><br>Hands-on activities<br><br>Problem solving<br><br>Laboratory exercises | Assignments<br><br>Quizzes<br><br>Graded laboratory activities | f, i, j, k | a, d, e | Value of listening and appreciation<br><br>Value of exploration<br><br>Value of logical analysis |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **TOPIC 5: Introduction to Arduino (10 hour)** | | | | | | |
| 5.1. Definition and Functions of the following;<br><br>• Power supply<br>• VCC<br>• GND<br>• Bread Board<br>• Resistors<br>• Jumper Wires<br>• Light Emitting Diode (LED)<br>• Electrical Circuit Formula<br>• Electronic Symbols<br><br>5.2. Discuss the following;<br>• Arduino<br>• Arduino Family<br>• Arduino Uno R3<br>• Basic Parts of Arduino Uno R3<br>• Arduino IDE<br><br>5.3. Basic Circuit Exercises on<br>• Light a LED<br>• Series Circuit | The student can: | Asynchronous discussions<br><br>Interactive discussions<br><br>Hands-on activities<br><br>Problem solving<br><br>Laboratory exercises discussions | Assignments<br><br>Quizzes<br><br>Graded laboratory activities | f, i, j, k | a, d, e | Value of listening and appreciation<br><br>Value of exploration<br><br>Value of logical analysis |

| | | | | | | |
|---|---|---|---|---|---|---|
| • Parallel Circuit<br>5.4. Basic Structure of Programming Arduino | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **TOPIC 6. ROBOT PROGRAMMING WITH ARDUINO (14 hours)** | | | | | | |
| 1. 6.1. Introduction to Robotics<br>2. 6.2. Using and Maintaining Robot kits for the classroom<br>3. 6.3. Programming in Logo Blocks and C for the Arduino microcontroller variants<br>4. 6.4. Activating and using actuators for the microcontroller. Actuators include LED, motors and Sounds | | | | | | |
| **TOPIC 7. ROBOT GAMES AND IR REMORE CONTROL (14 hours)** | | | | | | |
| 7.1. Robot movements with different configuration<br>7.2. Using various sensor in making a robot react to tis environment<br>7.3. Robots performing tasks found as problem to be solved in competitions | | | | | | |
| **TOPIC 8. RIM PROJECT IDEAS & EVALUATION (14 hours)** | | | | | | |
| 8.1. Conduct a research of problems in the community<br>8,2, Creating Innovative project as part of solution to problems in the community<br>8.3. Using various sensors in | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| making their project prototype<br>8.4. Presentation of their project | | | | | | |
| **Total number of hours with laboratory (94 hours)** | | | | | | |

| | | |
|---|---|---|
| Lectures | 36 | hours |
| Laboratory | 54 | hours |
| Examination | 4 | hours |

**8. Course Evaluation**

**Course Requirements** **:** 80% running program

**Grading System:**

**MID-TERM** and **FINAL-TERM**

| | |
|---|---|
| Participation/Attendance | 10% |
| Quiz / Assignment | 20% |
| Actual Hands-On Activities | 30% |
| Exam | 40% |
| **TOTAL** | **100%** |

**Schedule of Examination:**

Midterm :
Final Term :
Classes End :

**References:**

**Textbooks:**

Programming Embedded Systems in C and C++, First Edition
January, Michael Barr, O' Reilly Introduction to embedded systems,
Shibu K V Tata McGraw-Hill.

**Supplemental:**

http://www.csulb.edu/colleges/coe/cecs/views/programs/undergrad/grade_prog.shtml
https://www.udemy.com/complete-c-programming-step-by-step-tutorial/
http://www.c4learn.com/c-programming/learn-c-programming-language-step-by-step-tutorials/

**Prepared by:**

**CERILO B. RUBIN, JR.**
FACULTY

**Checked by:**

**CERILO B. RUBIN, JR. , MIT**
Program Chairman, BSIT

**Approved:**

**ELBREN O. ANTONIO, DIT**
Dean, College of Computer Studies