EE2004: MICROCOMPUTER SYSTEMS

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Microcomputer Systems

Subject Code
EE - Electrical Engineering

Course Number
2004

Academic Unit
Electrical Engineering (EE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
EE2000 Logic Circuit Design and CS2311 Computer Programming

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil
Part II Course Details

Abstract
The aim of this course is to introduce the basic structure of modern computer systems and to learn programming computers at the assembly level with the concepts of instruction set architecture, datapath, control unit, memory system and I/O interfaces.

Course Intended Learning Outcomes (CILOs)

<table>
<thead>
<tr>
<th>CILOs</th>
<th>Weighting (if app.)</th>
<th>DEC-A1</th>
<th>DEC-A2</th>
<th>DEC-A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Describe the structure and major components of a microcomputer system</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>2. Explain the idea behind memory hierarchy its use in memory caches and virtual memory.</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>3. Describe how CPUs communicates with peripheral devices.</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>4. Apply C/Assembly programming techniques to simple problems.</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing/constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Teaching and Learning Activities (TLAs)

<table>
<thead>
<tr>
<th>TLAs</th>
<th>Brief Description</th>
<th>CILO No.</th>
<th>Hours/week (if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lecture</td>
<td>Explain key concepts in microcomputer systems</td>
<td>1, 2, 3, 4</td>
<td>3 hrs/week</td>
</tr>
<tr>
<td>2. Tutorial</td>
<td>Explain key concepts in microcomputer systems</td>
<td>1, 2, 3, 4</td>
<td>1 hr/week for 8 weeks, Or 2hrs/week for 13 weeks in Laboratory</td>
</tr>
<tr>
<td>3. Laboratory experiment Or</td>
<td>Allow students to gain practical experiences on interacting with the microcomputer system</td>
<td>1, 2, 3, 4</td>
<td>3 hrs/week for 5 weeks, Or Take-home mini-project</td>
</tr>
</tbody>
</table>
Assessment Tasks / Activities (ATs)

<table>
<thead>
<tr>
<th>ATs</th>
<th>CILO No.</th>
<th>Weighting (%)</th>
<th>Remarks (e.g. Parameter for GenAI use)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Tests (min.: 2)</td>
<td>1, 2, 3, 4</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>2 #Assignments (min.: 3)</td>
<td>1, 2, 3, 4</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>3 Lab Exercises/Reports</td>
<td>1, 2, 3, 4</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

Continuous Assessment (%)
50

Examination (%)
50

Examination Duration (Hours)
2

Additional Information for ATs
Remark:
To pass the course, students are required to achieve at least 30% in course work and 30% in the examination. When the laboratory experiments are involved in TLA, 75% laboratory attendance rate must be obtained. When the mini-project is involved in TLA, 75% tutorial attendance rate must be obtained.

# may include homework, tutorial exercise

Assessment Rubrics (AR)

Assessment Task
Examination

Criterion
Ability in achieving CILOs

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Coursework

Criterion
Ability in achieving CILOs
Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

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Part III Other Information

Keyword Syllabus
1. Introduction of Computer Structure: CPU, Memory, and IO, Bus and Data path
2. CPU registers and control units, bus and data path.
3. Assembly Language: Addressing modes, instruction sets, stack, and programming techniques
4. Memory System: Hierarchy: Memory systems. Input/output technique
5. Input/output techniques: programmed I/O and interrupt.

Laboratory Experiments:
1. Assembly language programming
2. I/O programming: Interacting with 7-segment LEDs and keypads
3. Interfacing with peripheral devices, such as timers and EEPROM.
4. Case study of serial communication protocols.

Reading List

Compulsory Readings

<table>
<thead>
<tr>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Lecture/tutorial notes</td>
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</table>

Additional Readings

<table>
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