



## UNIVERSITI TEKNOLOGI MARA

### PHY415: PHYSICS VI: ELECTRONICS

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| <b>Course Name (English)</b>   | PHYSICS VI: ELECTRONICS <b>APPROVED</b>  |
| <b>Course Code</b>   | PHY415   |
| <b>MQF Credit</b>  | 4  |
| <b>Course Description</b>  | This course will interactively engage students cognitively and scientifically in introductory-level knowledge of electronics with the focus on TTL/CMOS-based digital electronics. It starts with the essential knowledge of digital concepts and circuits and simple interfacing of integrated circuit to analog devices. Students also will define the concepts of introductory knowledge of basic analogue electronic devices used in conjunction with digital circuit and the use of computers in interfacing. Lab exercises cover minimum technical knowledge and skill required for implementing simple electronic and interfacing circuits as a part of application of electronics. The outcomes shall be accessed through a variety of tools which include paper examination, viva, and test and classroom engagement. |
| <b>Transferable Skills</b>   | Upon completion of this course, students should be able to:<br><br>1. State, write and explain the concepts of logic gates<br><br>2. Verbally, visually (pictures & graphs) and discuss the concepts, measurements of digital electronics, explain and capable to construct circuits from logic gates and analogue components<br><br>3. Identify and assemble simple electronic circuits with display.<br><br>4. Discuss and summarize ADC/DAC concepts and the use of computers for simple interfacing  |
| <b>Teaching Methodologies</b>  | Lectures, Lab Work   |
| <b>CLO</b>   | CLO1 State, write and explain the concepts of logic gates<br>CLO2 Verbally, visually (pictures & graphs) and discuss the concepts, measurements of digital electronics, explain and capable to construct circuits from logic gates and analogue components<br>CLO3 Identify and assemble simple electronic circuits with display.<br>CLO4 Discuss and summarize ADC/DAC concepts and the use of computers for simple interfacing   |
| <b>Pre-Requisite Courses</b>   | No course recommendations  |
| <b>Topics</b>  |  |
| <b>1. Introductory Digital Concepts</b><br>1.1) 1. Digital and analogue quantities<br>1.2) 2. Binary digits, logic levels and digital waveforms<br>1.3) 3. Introduction to logic operation |  |
| <b>2. Number systems, operations and codes</b><br>2.1) 1. Decimal numbers<br>2.2) 2. Binary numbers<br>2.3) 3. Decimal to binary conversion<br>2.4) 4. Binary coded decimal (BCD)          |  |

**3. Constructing circuits using binary logic gates**

- 3.1) 1. Boolean Operation and expressions
- 3.2) 2. Laws and rules of Boolean algebra
- 3.3) 3. DeMorgan's Theorem
- 3.4) 4. Boolean analysis of logic circuits
- 3.5) 5. Boolean expression and truth tables
- 3.6) 6. Karnaugh Map
- 3.7) 7. Karnaugh Map SOP minimization
- 3.8) 8. Karnaugh Map POS minimization

**4. Interfacing with integrated circuits**

- 4.1) 1. Logic levels
- 4.2) 2. Interfacing TTL and CMOS
- 4.3) 3. Interfacing TTL and CMOS with switches
- 4.4) 4. Interfacing TTL and CMOS with LEDs
- 4.5) 5. Interfacing with buzzers, relays and motor

**5. Seven segment displays**

- 5.1) 1. BCD codes
- 5.2) 2. Encoders
- 5.3) 3. Decoders
- 5.4) 4. TTL BCD to seven segment Decoder/driver

**6. Flip-Flops**

- 6.1) 1. R-S flip-flop, D Flip-flop, J-K Flip-flop
- 6.2) 2. IC latches
- 6.3) 3. The 555 IC timer
- 6.4) 4. Triggering Flip-flop
- 6.5) 5. Application in ripple counters

**7. Counters**

- 7.1) 1. Ripple counter
- 7.2) 2. Mod-10 Ripple counters
- 7.3) 3. Synchronous counters
- 7.4) 4. Down Counters
- 7.5) 5. Self-stopping counters
- 7.6) 6. TTL and CMOS IC counters

**8. Interfacing with analog devices**

- 8.1) 1. D/A converter
- 8.2) 2. A/D converter,
- 8.3) 3. Voltage comparator
- 8.4) 4. Digital Voltmeter
- 8.5) 5. Digital Light meter
- 8.6) 6. Sensors and Transducers

**9. Power Supplies**

- 9.1) 1. PN junction
- 9.2) 2. Diodes
- 9.3) 3. Rectification
- 9.4) 4. Full-wave rectification
- 9.5) 5. Ripple and regulation
- 9.6) 6. Zener regulators

| Assessment Breakdown  | %      |
|-----------------------|--------|
| Continuous Assessment | 50.00% |
| Final Assessment      | 50.00% |

| Details of Continuous Assessment | Assessment Type | Assessment Description  | % of Total Mark | CLO                      |
|----------------------------------|-----------------|---|-----------------|--------------------------|
|                                  | Lab Exercise    | n/a   | 20%             | CLO2                     |
|                                  | Test            | number of test = 3, mark = 3 x 10% = 30%, Duration = 60 minutes each test | 30%             | CLO1 ,<br>CLO3 ,<br>CLO4 |

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|--------------------|---|---|
| Reading List       | Reference Book Resources                              | <ul style="list-style-type: none"> <li>• Tokheim 1990, <i>Digital Electronics</i>, McGraw-Hill</li> <li>• Charles A. Schuler 1989, <i>Electronics Principles and Applications</i>, McGraw-Hill Publishing Company</li> <li>• Floyd T. L 2006, <i>Digital Fundamentals</i>, Prentice Hall</li> </ul> |
| Article/Paper List | This Course does not have any article/paper resources |   |
| Other References   | This Course does not have any other resources         |   |