

COURSE ELT2060: DIGITAL TECHNOLOGY 2**Level:** Intermediate**Theme:** Computer Logic Systems**Prerequisite:** ELT1060 Digital Technology 1**Description:** Students demonstrate knowledge of digital principles, by using small-scale transistor–transistor logic (TTL) and complementary metal oxide semiconductor (CMOS) integrated technology.**Parameters:** Digital logic trainer, oscilloscope, function generator and related resources.**Supporting Course:** ELT2010 Electro-assembly 2**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • identify and interface components with TTL and CMOS small-scale integrated circuit (IC) families 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • use TTL and CMOS small-scale integrated technology ICs to: <ul style="list-style-type: none"> – identify the IC by number on the case and identify the family it belongs to using data manuals, CD ROMs, data programs – identify the pinouts concerning ground and voltage of both TTL and CMOS ICs using data manuals or CD ROMs, data programs – experiment with both CMOS and TTL ICs involving AND, NAND, NOR, OR, X-NOR, NOT gates using computer simulation or logic trainers – interface between various TTL and CMOS ICs – develop boolean expressions for all basic gates used in TTL and CMOS technology – develop truth tables for basic gates used in both TTL and CMOS ICs – explain various numbering systems and binary codes. <p><i>Assessment Tool</i> <i>ELTLAB–3: Assessment Checklist: Laboratory Practice, Part 1</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p>	40

COURSE ELT2060: DIGITAL TECHNOLOGY 2 (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • identify components and construct a prototype of typical small-scale and complex logic networks, using TTL and CMOS families of ICs • demonstrate established laboratory procedures and safe work practices • demonstrate basic competencies. 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • given both TTL and CMOS small-scale and complex logic networks, the student will: <ul style="list-style-type: none"> – identify each according to gate function, type of Flip-Flop or counter or register according to number system and data reference manuals or computer programs – experiment with various gates connected into a logic network (actual or computer simulation) – develop boolean expression for gate networks – demonstrate simplification of boolean expressions, gate minimization, Karnaugh mapping – experiment with devices, such as registers, decoders, converters, multiplexes, etc. • using small-scale logic networks, prototype the solution using digital logic circuits in combination and sequential logic design <ul style="list-style-type: none"> – construct and fabricate the circuit. <p><i>Assessment Tool</i> <i>ELTLAB–3: Assessment Checklist: Laboratory Practice, Parts 1 and 2</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p> <ul style="list-style-type: none"> • observed performance in following: <ul style="list-style-type: none"> – established laboratory procedures – correct procedures when working with electrostatic charges and grounding straps – recommended voltage and current rating of IC families. <p><i>Assessment Tool</i> <i>ELTPSP: Assessment Checklist: Laboratory Procedures and Safety Practices</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p> <ul style="list-style-type: none"> • observations of individual effort and interpersonal interaction during the learning process. <p><i>Assessment Tool</i> <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>55</p> <p>5</p> <p>Integrated throughout</p>

COURSE ELT2060: DIGITAL TECHNOLOGY 2 (continued)

Concept	Specific Outcomes	Notes
Safety/Resource Management	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • explain and demonstrate how to avoid electrostatic discharges around IC chips, using static mats, grounding straps • demonstrate an understanding of grounding, voltage and current rating of various IC families. 	Grounding, VCC, VDD, VSS, positive and negative voltages.
Fundamentals	<ul style="list-style-type: none"> • explain the difference between various gate applications, counters and registers • distinguish the difference among various numbering systems and binary codes, such as: <ul style="list-style-type: none"> – binary – octal – hexadecimal – Binary Coded Decimal (BCD) – American Code for Information Interchange (ASCII). 	Demonstrate the use of: <ul style="list-style-type: none"> • Flip-Flops • JK • RS • D Type • T Type.
Real-world Applications	<ul style="list-style-type: none"> • solve, construct and experiment with real-world problems using combination and sequential logic design for applications such as traffic lights, aircraft landing gear and motor controls • prototype the solution for a logic problem on a breadboard and develop a truth table • use emulation software on a design problem. 	<i>Electronic workbench.</i>
Applied Mathematics	<ul style="list-style-type: none"> • demonstrate the use of boolean algebra to analyze a logic circuit. 	DeMorgan's theorems. Boolean expressions for gate networks. Simplification of boolean expressions. Gate minimization. Karnaugh mapping.

COURSE ELT2060: DIGITAL TECHNOLOGY 2 (continued)

Concept	Specific Outcomes	Notes
Designing and Prototyping	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • demonstrate how to prototype and troubleshoot the following fundamental logic gates in typical and complex logic networks: <ul style="list-style-type: none"> – AND – NAND – NOR – X-NOR – OR, Registers – F/F counters – simple comparators. 	
Fabricating/Testing	<ul style="list-style-type: none"> • use a printed circuit board (PC board) to fabricate a digital circuitry project, such as: <ul style="list-style-type: none"> – digital dice – sound generator decision maker – electronic scoreboard – IC tester • use a PC board software to layout a digital circuit. 	