



Institiúid Teicneolaíochta Chorcaí  
Cork Institute of Technology

## ELTR6006: Digital Systems 2

### Module Details

<b>Short Title:</b>	Digital Systems 2	<b>APPROVED</b>
<b>Full Title:</b>	Digital Systems 2	
<b>Module Id:</b>	4830	
<b>Official Code:</b>	ELTR6006	<b>NFQ Level:</b> 6
		<b>ECTS Credits:</b> 5

<b>Coordinator:</b>	JOSEPH CONNELL
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<b>Description:</b>	This module builds on Digital Systems I and introduces the learner to practical combinational and sequential logic circuits such as adders and decoders, flip-flops, counters, and registers. An emphasis is placed on the selection, use, and application of standard IC chips to implement these circuits.
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### Learning Outcomes:

*On successful completion of this module the learner will be able to...*

1. Draw logic diagrams and describe the function of a range of combinational logic circuits such as adders, comparators, decoders, encoders, and multiplexers.
2. Draw logic diagrams, truth tables and timing diagrams for all common flip-flops and use these to implement sequential logic circuits such as counters, parallel registers, and shift registers.
3. Identify common MSI chips for the combinational and sequential logic circuits above and with the aid of information from manufacturers data sheets, interpret and describe the features found in these chips.
4. Use pinout and functional block diagrams to show how the MSI chips can be configured and cascaded to implement combinational and sequential circuits for various applications.
5. Work alone and in groups to analyse, measure, and interpret the performance of combinational and sequential logic circuits by means of computer-aided-learning software, (FACET), and construct and test a selection of these circuits using standard MSI chips.

### Pre-requisite learning

#### Module Recommendations

*This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named CIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).*

Digital Systems 1 or equivalent.

#### Incompatible Modules

*These are modules which have learning outcomes that are too similar to the learning outcomes of this module. You may not earn additional credit for the same learning and therefore you may not enrol in this module if you have successfully completed any modules in the incompatible list.*

No incompatible modules listed

#### Module Requirements

*This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed. You may not enrol on this module if you have not acquired the learning specified in this section.*

No requirements listed



## Module Content &amp; Assessment

## Indicative Content

**• Combinational logic circuits**

Typical combinational logic circuits: adders, comparators, decoders, encoders, multiplexers, demultiplexers, BCD-to-7-segment decoder. Simple block and circuit diagram of each circuit. Functional block diagram of representative MSI chip(s). Cascading of these chips. Simple application of each circuit.

**• Flip-flops**

Basic flip-flop (S-R latch). Switch de-bounce application. Clocked flip-flops: level-triggered and edge-triggered. Asynchronous inputs. D flip-flop. 4-bit parallel register. J-K flip-flop. T flip-flop. Flip-flop operating parameters. Common flip-flop chips.

**• Counters**

Asynchronous full-modulus counters. Asynchronous decade counter. 3-digit BCD counter with display. Simple synchronous counter circuits. Typical binary and BCD counter chips. Cascading of counter chips.

**• Shift Registers**

Basic SISO circuit with recirculation. SIPO circuit: serial-to-parallel data conversion. PISO circuit: parallel-to-serial data conversion. Bi-directional shift registers. Typical shift register chips. Cascading of shift register chips.

Assessment Breakdown		%
Course Work		30%
End of Semester Formal Examination		70%

	Outcome addressed	% of total	Assessment Date
<b>Formal End-of-Semester Examination</b>	1,2,3,4	70%	Semester End

Coursework Breakdown				
Type	Description	Outcome addressed	% of total	Assessment Date
Performance Evaluation	A week-by-week assessment of practical competency through computer-aided laboratory-based assignments with selected reports	5	20	Every Week
Open-book Examination	A one-hour open-book assessment comprising a number of short quiz-type questions	1,2,3	10	Week 6

**The institute reserves the right to alter the nature and timings of assessment**



## Module Workload &amp; Resources

Workload		Full-time mode		
Type	Description	Hours	Frequency	Average Weekly Learner Workload
Lecture	Three one-hour lectures on basic theory.	3	Every Week	3.00
Lab	A two-hour laboratory-based session covering analysis, testing and measurement of relevant logic circuits using a computer-aided-learning package, (FACET).	2	Every Week	2.00
Independent & Directed Learning (Non-contact)	Review of lecture notes and recommended material and preparation of reports for selected laboratory sessions.	2	Every Week	2.00
Total Weekly Learner Workload				7.00
Total Weekly Contact Hours				5.00

Workload		Part-time mode		
Type	Description	Hours	Frequency	Average Weekly Learner Workload
Lecture	Lecture(s) on basic theory	3	Every Week	3.00
Lab	A laboratory-based session covering analysis, testing and measurement of relevant logic circuits using a computer-aided-learning package, (FACET).	2	Every Second Week	1.00
Independent & Directed Learning (Non-contact)	Review of lecture notes and recommended material and preparation of reports for selected laboratory sessions.	3	Every Week	3.00
Total Weekly Learner Workload				7.00

## Resources

## Recommended Book Resources

- Thomas L. Floyd 2006, *Digital Fundamentals*, 9th Ed. Ed., Chapters 6 - 9 incl., Pearson Prentice Hall: Upper Saddle River, NJ, USA [ISBN: 0131972553]

## Supplementary Book Resources

- Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss 2004, *Digital systems : principles and applications*, 9th Ed. Ed., Pearson/Prentice Hall: Upper Saddle River, N.J. USA [ISBN: 0131219316]

## Other Resources

- Various websites for relevant data sheets and other material as recommended during the module: NA