



COURSE SPECIFICATION

(LOGIC DESIGN-1)

| | |
|---|---|
| Programme(s) on which the course is given | CS, IT, IS and OR |
| Major or Minor element of programs | Major |
| Department offering the program | Computer Science |
| Department offering the course | Computer Science |
| Academic year / Level | 1 st year / 2 nd semester |

A- Basic Information

| Title | Logic Design-1 | | | Code | CS121 | |
|--------------|----------------|---|----------|------|-----------|---|
| Credit Hours | Lecture | 3 | Tutorial | 1 | Practical | 2 |
| | Total | | | | 6 | |

B- Professional Information

1- Overall aims of course

- Understand the principles and operations of combinational circuits, starting from gates till complete combinational circuits.
- Understand the design of decoders, encoders, multiplexer, demultiplexer, and their applications
- Understand the digital electronics and logic families.

2- Intended learning outcomes of course (ILOs)

2a-Knowledge and understanding

- a5** Recognize and appreciate the professional and ethical responsibilities of the practicing computer professional including understanding the need for quality.

2b-Intellectual skills

- b1** Solve a wide range of problems related to the analysis, design and construction of computer systems

b2 Analyze the requirements of a range of computer-based systems and examine the design alternatives based on the constraints imposed by society, organizations, and technology.

2c- Professional and practical skills

c6 Use appropriate computer-based design support tools

c8 Appreciate the features of complex computing hardware and software and operate them effectively

2d- General and transferable skills

d4 Strike the balance between self-reliance and seeking help when necessary in new situations.

d8 Retrieve information from a variety of sources such as libraries, printed or electronic sources.

3- Contents

| Topic | No of hours | Lecture | Tutorial/ Practical |
|--|--------------------|----------------|----------------------------|
| 1 Introduction | 3 | 3 | - |
| 2 Number systems and Codes <ul style="list-style-type: none"> • Binary, Octal and Hex Number Systems • Number Systems Conversions. • BCD, Gray and Alphanumeric Codes. • Error Detection. | 12 | 6 | 6 |
| 3 Digital Arithmetic <ul style="list-style-type: none"> • Binary addition and Subtraction. • Binary Multiplication and Division. • BCD Addition and Hex. Arithmetic | 6 | 3 | 3 |
| 4 Logic Gates <ul style="list-style-type: none"> • Boolean Constants and Variables. • Truth Tables. • OR, AND, and NOT Operations. • Logic Algebra and Logic Implementation. • NOR and NAND Gates. | 9 | 6 | 3 |
| 5 Boolean Algebra and Logic Simplification <ul style="list-style-type: none"> • Boolean and Demorgan's Theorems. • Universality of NAND and NOR Gates. • Alternative Representations. • Labeling Logic Signals. • SOP and POS Forms. • Simplifying Logic Circuits using algebra and K-maps. | 15 | 9 | 6 |
| 6 Combinational Logic <ul style="list-style-type: none"> • Introduction • Basic Circuits and Design Procedure. • Using NAN and NOR gates in Design. • Display Devices | 6 | 3 | 3 |

| | | | |
|---|-----------|-----------|-----------|
| 7 Programmable Logic <ul style="list-style-type: none"> • Introduction • Programmable arrays • Programmable Array logic • Generic Array Logic • The GALs 22V10 and 16V8 • Introduction to CPLDs and FPGAs | 6 | 3 | 3 |
| 8 Combinational Circuits <ul style="list-style-type: none"> • Introduction. • Arithmetic Circuits and Comparators. • Decoders, and Encoders. • Multiplexers and Demultiplexers. | 12 | 6 | 6 |
| 9 Combinational Logic Programming. <ul style="list-style-type: none"> • Introduction • Describing Logic circuits • Development Software • Description languages and Programming Languages • Implementing Logic Circuits using PLDs • VHDL Format and Syntax • Intermediate signals in VHDL • Representing Data in VHDL • Truth Tables using VHDL • Decision Control Structures • Implementing Adders, Decoders, Encoders, Multiplexers, Demultiplexers, Magnitude Comparators, Code Converters. | 12 | - | 12 |
| 10 Logic Families <ul style="list-style-type: none"> • Introduction. • Diode, RTL, DTL, ECL, and TTL Logic. • CMOS Logic. | 3 | 3 | - |
| Total sum | 84 | 42 | 42 |

4- Teaching and learning methods

- 4.1 Lectures.
- 4.2 Practical experiments in the laboratory.
- 4.3 Exercises and tutorials.
- 4.4 Research assignments.

5- Student assessment methods

5-a Methods

- 5.a.1 Reports, assignments, and exercises to assess knowledge and understanding.

- 5.a.2 Regular oral, practical and written quizzes to assess intellectual skills.
- 5.a.3 Practical projects, final practical and oral exams to assess professional skills.
- 5.a.4 Reports, assignments, and discussions to assess general and transferable skills.
- 5.a.5 Final written exam to assess knowledge and understanding.

5-b Assessment schedule

| | | |
|--------------|---|---------------|
| Assessment 1 | 5 th week. | Mid term exam |
| Assessment 2 | 8 th week. | |
| Assessment 3 | 10 th week. | |
| Assessment 4 | 16 th week (Oral and practical) | |
| Assessment 5 | 17 th -18 th weeks (final written exam) | |

5-c Weighting of assessments

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|-------------------------------|------|
| Semester work | 10% |
| Mid-term examination | 10% |
| Oral / Practical examination. | 20% |
| Final-term examination | 60% |
| Total | 100% |

6- List of references

6-a Course notes

There are lectures notes prepared in the form of a book authorized by the department

6-b Essential books (text books)

None

6-c Recommended books

- [1] R. Tocci, Digital Systems Principles and Applications, six edition, 1991, Prentice-Hall, Inc.
- [2] B. Holdsworth, Digital Logic Design, Third edition, 1993, Butterworth-Heinemann Ltd.
- [3] R. Tocci, Digital Circuits, Prentice-Hall Inc., 2001.
- [4] A book prepared and edited by the lecturer, and approved by the department council.

6-d Periodicals, Web sites, ... etc

IEEE transactions on computers and software.

7- Facilities required for teaching and learning

- Digital Design and logic programming laboratories.
- Laboratory equipments, apparatus and kits.
- Datashow, screen, and laptop computer.

Course coordinator:

Prof. Fawzy Ali Torkey

Head of Department:

Prof. Nabil Abd-El-Wahid Ismail

Date: / /