



Course Specification

— (Bachelor)

Course Title: **Introduction to Computer Arithmetic**

Course Code: **CENX 416**

Program: **B.S. in Computer Engineering**

Department: **Department of Computer Engineering**

College: **College of Computer and Information Sciences**

Institution: **King Saud University**

Version: *Course Specification Version Number*

Last Revision Date: *Pick Revision Date.*

Table of Contents

A. General information about the course:	3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods	4
C. Course Content	5
D. Students Assessment Activities	5
E. Learning Resources and Facilities	5
F. Assessment of Course Quality	6
G. Specification Approval	6

A. General information about the course:

1. Course Identification

1. Credit hours: (3 hours)

2. Course type

A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others
B. ☐ Required ☒ Elective

3. Level/year at which this course is offered: (9th or 10th Semester)

4. Course general Description:

Students will be introduced to several computer arithmetic topics. Topics include: Standard and unconventional number representations, design of fast two-operand and multi-operand adders, high-speed multiplication and division algorithms, floating-point numbers, algorithms, and hardware algorithms. Also, implementation like pipelined, digit-serial and fault-tolerant arithmetic processors are introduced.

5. Pre-requirements for this course (if any):

CENX 316: Computer Architecture

6. Co-requirements for this course (if any):

7. Course Main Objective(s):

The aim of the course is to provide an understanding of algorithms and structures used for efficient implementation of all basic arithmetic operations (addition, subtraction, multiplication, etc.). The focus is on implementation of these operations in VLSI friendly circuits targeting multiple applications.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	4 hours per week	100%
2	E-learning		
3	Hybrid - Traditional classroom - E-learning		
4	Distance learning		



3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	15
5.	Others (specify)	
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Describe positional and non-positional representation in digital systems, including the representation of floating-point numbers.	1	Lectures and Tutorials	Exams and Homework
1.2	Explain traditional arithmetic algorithms and their hardware implementations.	1	Lectures and Tutorials	Exams and Homework
1.3	Explain real-number arithmetic.	1	Lectures and Tutorials	Exams and Homework
2.0	Skills			
2.1	Examine different non-traditional arithmetic algorithms and their hardware implementations.	2	Lectures and Tutorials	Exams and Homework
2.2	Evaluate the use of pipelining in arithmetic circuits.	7	Lectures and Tutorials	Exams and Homework
3.0	Values, autonomy, and responsibility			
3.1				
3.2				
...				



C. Course Content

No	List of Topics	Contact Hours
1.	Number representation for conventional and unconventional arithmetic	8
2.	Addition/Subtraction algorithms and circuits	12
3.	Multiplication algorithms variations and circuits	12
4.	Division algorithms variations and circuits	12
5.	Real Arithmetic representation, operations and circuits	8
6.	Implementation topics	8
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Examination (1)	6	15%
2.	Midterm Examination (2)	12	15%
3.	Homework Assignments	Every 14 days	30%
4.	Final Exam	End	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Computer Arithmetic Algorithms, Koren, Israel, A.K. Peters, Natick, MA, 2002.
Supportive References	Computer Arithmetic: Algorithms and Hardware Designs, Oxford University Press, New York, 2nd Edition, 2010.
Electronic Materials	Computer Arithmetic and Verilog HDL Fundamentals, Cavanagh, Joseph, CRC Press, 2009.
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture room with number of seats enough to accommodate enrolled students.





Items	Resources
Technology equipment (projector, smart board, software)	Overhead projector with required software to facilitate presentations on smart board.
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Department Council	Course reports are evaluated by the Department Council.
Effectiveness of Students assessment	Faculty-Peer Review	Final examination is moderated.
Quality of learning resources	Students	Indirect – Edu-gate survey.
The extent to which CLOs have been achieved	Students	Attainment level of every CLO is measured directly.
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	

