**EDITH COWAN UNIVERSITY**
**FACULTY OF COMPUTING, HEALTH AND SCIENCE**
**SCHOOL OF ENGINEERING AND MATHEMATICS**

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| **UNIT :** | ENS1161 - Computer Fundamentals |
| **VERSION :** | 3 |
| **STATUS :** | **Enrolment Approved** |
| **HECSBAND :** | 2 |
| **CREDIT POINTS :** | 15 |
| **SEMESTER TYPE :** | Semester Unit |
| **MODE OF DELIVERY :** | Campus-Based |

**DESCRIPTION :**
This unit presents fundamental topics in discrete mathematics that are essential to computing studies including logic, Boolean algebra and logic circuits, set theory, counting techniques, computer arithmetic, graph theory and matrix algebra with applications to computing. It also provides an introduction to the representation of numbers in a computer, and assembly language programming for a microprocessor.

**LEARNING OUTCOMES**
On completion of this unit students should be able to:

1. use the laws of propositional logic to simplify or analyse compound propositions; use truth tables to establish logical equivalence and validity of arguments;
2. use set operations and Venn diagrams; apply elementary counting techniques;
3. use Boolean algebra and Karnaugh maps to simplify Boolean expessions; design, analyse and/or simplify logic circuits;
4. represent relations using graphs, ordered pairs and directed graphs; identify equivalence relations; use modular arithmetric; use function notation; identify onto and one-to-one functions; use composition of functions; find the inverse of a function;
5. convert integers and fractions between decimal, octal, binary and hexadecimal number systems; perform simple arithmetic in these systems;
6. use 2’s complement representation of integers; interpret addition operations using CCR flags; perform BCD addition; use ASCII codes;
7. write or analyse simple assembly language programs for the M6800 microprocessor;
8. identify isomorphic graphs and planar graphs; use matrix representation of graphs; identify Eulerian and Hamiltonian graphs;
9. find sums and products of matrices; apply the algebra of matrices to simple exercises in computer graphics and cryptography.

**UNIT CONTENT**
1. Propositions, connectives and truth tables; logical equivalence; laws of logic; arguments; predicate logic.
2. Sets and set operations; Venn diagrams; laws of sets; cartesian product, counting techniques.
3. Boolean algebra; logic gates; Karnaugh maps; simplification of Boolean expressions; design and simplification of logic circuits; universality of NANDs.
4. Relations and their representations; equivalence relations and classes; modular arithmetic; application to cryptography. Function as process, function as relation; onto and one-to-one functions; composition and inverse functions.

5. Decimal, octal, binary and hexadecimal number systems and conversions of integers and fractions; arithmetic in these systems.
6. Computer representation of integers; addition and interpretation using CCR flags; addition of BCD numbers; ASCII code.
7. Introduction to assembly language programming of the Motorola 6800 chip using immediate, direct, inherent, relative and indexed addressing modes.
8. Null and complete graphs, complements; isomorphic graphs; matrix representation of graphs; planar graphs; Eulerian and Hamiltonian graphs.
9. Addition and multiplication of matrices; transpose; zero and identity matrices; laws of matrix algebra; inverse of a square matrix; finding determinant and inverse of 2´2 matrix; application of matrices to computer graphics and cryptography.

**TEACHING AND LEARNING PROCESSES**
Lectures and tutorial/workshop sessions.

**ASSESSMENT :**

| *Internal Assessment* | *Value* |
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| Assignment 1 | 15% |
| Assignment 2 | 15% |
| Examination | 70% |

NB: Students must pass the examination to pass the unit.

**TEXTS :**
Nil.

**SIGNIFICANT REFERENCES :**

Biggs, N. L. (1989). *Discrete mathematics.* Oxford: Clarendon Press.
Booth, D.J. (1995). *Foundation discrete mathematics for computing.* Melbourne: Chapman & Hall.
Chalk, B.S. (1996). *Computer organisation and architecture: an introduction.* London: Macmillan.
Clark, F.J. (1988). *Mathematics for programming computers.* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.
Clark, J. and Holton, D.A. (1996). *A first look at graph theory.* Singapore: World Scientific.
Graham, R.L., Knuth, D.E. and Patashnik, O. (1989). *Concrete mathematics: a foundation for computer science.* Reading, MA: Addison-Wesley Publishing Company.
Grossman, P. (1995). *Discrete mathematics for computing.* South Melbourne: Macmillan Education Australia.
Lipschutz, S. (1982). *Essential computer mathematics, Schaum Outline series in computers.* New York: McGraw-Hill Book Company.
Molluzzo, J.C. and Buckley, F. (1986). *A first course in discrete mathematics.* Belmont, Calif: Wadsworth.
Munro, J.E. (1992). *Discrete mathematics for computing,* Melbourne: Thomas Nelson.
Norris, F.R. (1985). *Discrete structures: an introduction to mathematics for computer science.* Englewood Cliffs, NJ: Prentice-Hall.
Pedler, P. (1999). *Maths success 11: discrete mathematics for the computer sciences.* Perth: Vineyard.
Quinn, J. (1992). *The 6800 Microprocessor.* Sydney: Macmillan.

Schiflet, A.B. (1987). *Discrete mathematics for computer science.* St Paul, MN: West Publishing Company.
Skvarcius R. and Robinson, W. (1986). *Discrete mathematics with computer science applications.* Menlo Park, Calif: Benjamin/Cummings Pub. Co.
Tocci, R.J. and Laskowski, L.P. (1986). *Microprocessors and microcomputers: the 6800 family.* Englewood Cliffs, NJ: Prentice Hall.

**Academic Misconduct Addendum for Unit Outlines.**

"Edith Cowan University regards academic misconduct of any form as unacceptable. Academic misconduct includes, but is not limited to:

- plagiarism;
- unauthorised collaboration;
- cheating in examinations;
- theft of other students' work.

The university defines academic misconduct as follows:

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| "academic misconduct" | means | conduct in relation to any academic work that is dishonest or unfair. |
| "cheating" | means | conduct in any assessment that is dishonest. |
| "plagiarism" | means | to knowingly or unknowingly present as one's own work the ideas or writings of another without appropriate acknowledgment or referencing This includes, but is not limited to:<br>• paraphrasing text without acknowledgment of the source;<br>• paraphrasing text inadequately with acknowledgment of the source;<br>• copying the text of another student's assignment or other students' assignments; and<br>• copying of visual representations (cartoons, line drawings, photos, paintings and computer programs). |

A staff member, who has reasonable grounds to believe that a student has committed some form of academic misconduct, shall follow the provisions of Admission, Enrolment and Academic Progress Rule 40 available in the ECU Handbook."