Embedded Programming
Course Outcome Summary

Course Information

Organization	Madison Area Technical College
Developers	Dr. Alberto Rodriguez
Development Date	6/16/2005
Course Number	10-605-173
Instructional Level	Associate Degree
Potential Hours of Instruction	90
Total Credits	3

Description
Introduction to the fundamentals of electronic computer language, systems and structure. Programming structures such as loops, branch decisions, data storage and bit-level processing will be covered. Languages include C, and assembly language. CrLf

Types of Instruction

Instruction Type	Contact Hours	Credits
Classroom Presentation	36	2
On-Campus Lab	54	1

Textbooks
Daniel W. Lewis. *Fundamentals of Embedded Software Where C Meets Assembly*. Prentice Hall. **ISBN:** 0-13-061589-7.

Fred G. Martin. *Robotic Explorations A Hands-On Introduction to Engineering*. Prentice Hall. **ISBN:** 0-13-089568-7.

Learner Supplies
Sensor & Parts Kit. **Quantity:** 1. **Source:** MATC-Parts Shop.

Prerequisites
The class is open to students to enroll even if they have not been admitted to a program.

AC-DC Electronics 1 (10-605-112) is strongly encouraged

Electronics 1 (10-605-118) is strongly encouraged

Exit Learning Outcomes
Core Abilities
A. Critical thinking

B. Science and Technology

Competencies

A. Analyze binary numbering system

You will demonstrate your competence:

A.1. by submitting a Binary Numbering System Problem set completed independently by the due date

A.2. by answering a test on Binary Numbering System independently and by the due date

A.3. by defending a C Language Binary Numbering System Practice Program completed by the due date

A.4. by actively participating in class on the topic of C Language Binary Numbering System

Your performance will be successful when:

A.1. Binary Numbering System Problem set include the correct solutions

A.2. Binary Numbering System Problem set shows all intermediate work to arrive to the correct solutions

A.3. Binary Numbering System Problem set is clearly written

A.4. Binary Numbering System Problem set neatly presented

A.5. Binary Numbering System Test score must exceed the passing level

A.6. Binary Numbering System Practice Program must compile without errors or warnings

A.7. Binary Numbering System Practice Program must execute without errors

A.8. Binary Numbering System Practice Program must yield the correct solution

A.9. you explain your Binary Number System Practice Program to your instructor

A.10. you answer questions regarding your Binary Number System Practice Program to your instructor

A.11. you listen attentively during class

A.12. you arrive in class on time

B. Analyze Basic C language structure

You will demonstrate your competence:

B.1. by submitting a Basic C Language Structure Problem set completed independently by the due date

B.2. by answering a test on Basic C Language Structure independently and by the due date

B.3. by defending a Basic C Language Structure Practice Program completed by the due date

B.4. by actively participating in class on the topic of Basic C Language Structures

Your performance will be successful when:

B.1. Basic C Language Structure Problem set includes the correct solutions

B.2. Basic C Language Structure Problem set shows all intermediate work to arrive to the correct solutions

B.3. Basic C Language Structure Problem set is clearly written

B.4. Basic C Language Structure Problem set neatly presented

B.5. Basic C Language Structure Test score must exceed the passing level

B.6. Basic C Language Structure Practice Program must compile without errors or warnings

B.7. Basic C Language Structure Practice Program must execute without errors

B.8. Basic C Language Structure Practice Program must yield the correct solution

B.9. you explain your Binary Number System Practice Program to your instructor

B.10. you answer questions regarding your Binary Number System Practice Program to your instructor

B.11. you arrive in class on time

B.12. you listen attentively during class

C. Analyze C language data types

You will demonstrate your competence:

C.1. by submitting a C Language Data Types problem set completed independently and by the due date

C.2. by defending a C Language Data Types program set completed independently and by the due date

C.3. by answering a C Language Data Types examination completed independently by the due date

C.4. by actively participating in class on the topic of C Language Data Types

Your performance will be successful when:

C.1. C Language Data Types problem set must include the correct answer

C.2. C Language Data Types problem set must be clearly written

C.3. C Language Data Types problem set is neatly presented

C.4. C Language Data Types program set must compile without errors

C.5. C Language Data Types program set must successfully execute

C.6. C Language Data Types program set must yield the correct solutions

C.7. C Language Data Types program set defense questions are answered in detail

C.8. C Language Data Types examination must exceed the minimum passing grade

C.9. you explain your C Language Data Types Program to your instructor

C.10. you answer questions regarding your C Language Data Types Program to your instructor

C.11. you arrive in class on time

C.12. you listen attentively during class

D. Analyze C language conditional structures

You will demonstrate your competence:

D.1. by submitting a C Language Conditional Structure problem set completed independently and by the due date

D.2. by defending a C Language Conditional Structures program set completed independently and by the due date

D.3. by answering a C Language Conditional Structures examination completed independently by the due date

D.4. by actively participating in class on the topic of C Language Conditional Structures

Your performance will be successful when:

D.1. C Language Conditional Structures problem set must include the correct answer

D.2. C Language Conditional Structures problem set must be clearly written

D.3. C Language Conditional Structures problem set is neatly presented

D.4. C Language Conditional Structures program set must compile without errors

D.5. C Language Conditional Structures program set must successfully execute

D.6. C Language Conditional Structures program set must yield the correct solutions

D.7. C Language Conditional Structures program set defense questions are answered in detail

D.8. C Language Conditional Structures examination must exceed the minimum passing grade

D.9. you explain your C Language Conditional Structures Program to your instructor

D.10. you answer questions regarding your C Language Conditional Structures Program to your instructor

D.11. you arrive in class on time

D.12. you listen attentively during class

E. Analyze C language looping structures

You will demonstrate your competence:

E.1. by submitting a C Language Loop Structures problem set completed independently and by the due date

E.2. by defending a C Language Loop Structures program set completed independently and by the due date

E.3. by answering a C Language Loop Structures examination completed independently by the due date

E.4. by actively participating in class on the topic of C Language Loop Structures

Your performance will be successful when:

E.1. C Language FOR Loop Structures problem set must include the correct answer

E.2. C Language FOR Loop Structures problem set must be clearly written

E.3. C Language FOR Loop Structures problem set is neatly presented

E.4. C Language FOR Loop Structures program set must compile without errors

E.5. C Language FOR Loop Structures program set must successfully execute

E.6. C Language FOR Loop Structures program set must yield the correct solutions

E.7. C Language FOR Loop Structures program set defense questions are answered in detail

E.8. C Language FOR Loop Structures examination must exceed the minimum passing grade

E.9. C Language WHILE Loop Structures problem set must include the correct answer

E.10. C Language WHILE Loop Structures problem set must be clearly written

E.11. C Language WHILE Loop Structures problem set is neatly presented

E.12. C Language WHILE Loop Structures program set must compile without errors

E.13. C Language WHILE Loop Structures program set must successfully execute

E.14. C Language WHILE Loop Structures program set must yield the correct solutions

E.15. C Language WHILE Loop Structures program set defense questions are answered in detail

E.16. C Language WHILE Loop Structures examination must exceed the minimum passing grade

E.17. C Language DO-WHILE Loop Structures problem set must include the correct answer

E.18. C Language DO-WHILE Loop Structures problem set must be clearly written

E.19. C Language DO_WHILE Loop Structures problem set is neatly presented

E.20. C Language DO-WHILE Loop Structures program set must compile without errors

E.21. C Language DO-WHILE Loop Structures program set must successfully execute

E.22. C Language DO-WHILE Loop Structures program set must yield the correct solutions

E.23. C Language DO-WHILE Loop Structures program set defense questions are answered in detail

E.24. C Language DO-WHILE Loop Structures examination must exceed the minimum passing grade

E.25. C Language Conditional Structures examination must exceed the minimum passing grade

E.26. you explain your C Language Loop Structures Program to your instructor

E.27. you answer questions regarding your C Language Loop Structures Program to your instructor

E.28. you arrive in class on time

E.29. you listen attentively during class

F. Analyze C language arrays

You will demonstrate your competence:

F.1. by submitting a C Language Arrays problem set completed independently and by the due date

F.2. by defending a C Language Arrays program set completed independently and by the due date

F.3. by answering a C Language Arrays examination completed independently by the due date

F.4. by actively participating in class on the topic of C Language Arrays

Your performance will be successful when:

F.1. C Language Arrays problem set must include the correct answer

F.2. C Language Arrays problem set must be clearly written

F.3. C Language Arrays problem set is neatly presented

F.4. C Language Arrays program set must compile without errors

F.5. C Language Arrays program set must successfully execute

F.6. C Language Arrays program set must yield the correct solutions

F.7. C Language Arrays program set defense questions are answered in detail

F.8. C Language Arrays examination must exceed the minimum passing grade

F.9. you explain your C Language Arrays Program to your instructor

F.10. you answer questions regarding your C Language Arrays Program to your instructor

F.11. you arrive in class on time

F.12. you listen attentively during class

G. Analyze C language functions

You will demonstrate your competence:

G.1. by submitting a C Language Functions problem set completed independently and by the due date

G.2. by defending a C Language Functions program set completed independently and by the due date

G.3. by answering a C Language Functions examination completed independently by the due date

G.4. by actively participating in class on the topic of C Language Functions

Your performance will be successful when:

G.1. C Language Functions problem set must include the correct answer

G.2. C Language Functions problem set must be clearly written

G.3. C Language Functions problem set is neatly presented

G.4. C Language Functions program set must compile without errors

G.5. C Language Functions program set must successfully execute

G.6. C Language Functions program set must yield the correct solutions

G.7. C Language Functions program set defense questions are answered in detail

G.8. C Language Functions examination must exceed the minimum passing grade

G.9. you explain your C Language Functions Program to your instructor

G.10. you answer questions regarding your C Language Functions Program to your instructor

G.11. you arrive in class on time

G.12. you listen attentively during class

H. Analyze C language pointers

You will demonstrate your competence:

H.1. by submitting a C Language Pointers problem set completed independently and by the due date

H.2. by defending a C Language Pointers program set completed independently and by the due date

H.3. by answering a C Language Pointers examination completed independently by the due date

H.4. by actively participating in class on the topic of C Language Pointers

Your performance will be successful when:

H.1. C Language Pointers problem set must include the correct answer

H.2. C Language Pointers problem set must be clearly written

H.3. C Language Pointers problem set is neatly presented

H.4. C Language Pointers program set must compile without errors

H.5. C Language Pointers program set must successfully execute

H.6. C Language Pointers program set must yield the correct solutions

H.7. C Language Pointers program set defense questions are answered in detail

H.8. C Language Pointers examination must exceed the minimum passing grade

H.9. you explain your C Language Pointers Program to your instructor

H.10. you answer questions regarding your C Language Pointers Program to your instructor

H.11. you arrive in class on time

H.12. you listen attentively during class

I. Analyze C language memory bit manipulation

You will demonstrate your competence:

I.1. by submitting a C Language Memory Bit Manipulation problem set completed independently and by the due date

I.2. by defending a C Language Memory Bit Manipulation program set completed independently and by the due date

I.3. by answering a C Language Memory Bit Manipulation examination completed independently by the due date

I.4. by actively participating in class on the topic of C Language Memory Bit Manipulation

Your performance will be successful when:

I.1. C Language Memory Bit Manipulation problem set must include the correct answer

I.2. C Language Memory Bit Manipulation problem set must be clearly written

I.3. C Language Memory Bit Manipulation problem set is neatly presented

I.4. C Language Memory Bit Manipulation program set must compile without errors

I.5. C Language Memory Bit Manipulation program set must successfully execute

I.6. C Language Memory Bit Manipulation program set must yield the correct solutions

I.7. C Language Memory Bit Manipulation program set defense questions are answered in detail

I.8. C Language Memory Bit Manipulation examination must exceed the minimum passing grade

I.9. you explain your C Language Bit Manipulation Program to your instructor

I.10. you answer questions regarding your C Language Bit Manipulation Program to your instructor

I.11. you arrive in class on time

I.12. you listen attentively during class

J. Analyze C language I/O hardware manipulation

You will demonstrate your competence:

J.1. by submitting a C Language I/O Hardware Manipulation problem set completed independently and by the due date

J.2. by defending a C Language I/O Hardware Manipulation program set completed independently and by the due date

J.3. by answering a C Language I/O Hardware Manipulation examination completed independently by the due date

J.4. by actively participating in class on the topic of C Language I/O Hardware Manipulation

Your performance will be successful when:

J.1. C Language I/O Hardware Manipulation problem set must include the correct answer

J.2. C Language I/O Hardware Manipulation problem set must be clearly written

J.3. C Language I/O Hardware Manipulation problem set is neatly presented

J.4. C Language I/O Hardware Manipulation program set must compile without errors

J.5. C Language I/O Hardware Manipulation program set must successfully execute

J.6. C Language I/O Hardware Manipulation program set must yield the correct solutions

J.7. C Language I/O Hardware Manipulation program set defense questions are answered in detail

J.8. C Language I/O Hardware Manipulation examination must exceed the minimum passing grade

J.9. you explain your C Language I/O Manipulation Program to your instructor

J.10. you answer questions regarding your C Language I/O Manipulation Program to your instructor

J.11. you arrive in class on time

J.12. you listen attentively during class

K. Analyze basic microcontroller assembly language programs

You will demonstrate your competence:

K.1. by submitting a basic microcontroller assembly problem set completed

independently and by the due date

K.2. by defending a basic microcontroller assembly program set completed independently and by the due date

K.3. by answering a basic microcontroller assembly examination completed independently by the due date

K.4. by actively participating in class on the topic of basic microcontroller assembly

Your performance will be successful when:

K.1. basic microcontroller assembly problem set must include the correct answer

K.2. basic microcontroller assembly problem set must be clearly written

K.3. basic microcontroller assembly problem set is neatly presented

K.4. basic microcontroller assembly program set must compile without errors

K.5. basic microcontroller assembly program set must successfully execute

K.6. basic microcontroller assembly program set must yield the correct solutions

K.7. basic microcontroller assembly program set defense questions are answered in detail

K.8. basic microcontroller assembly examination must exceed the minimum passing grade

K.9. you explain your basic microcontroller assembly Program to your instructor

K.10. you answer questions regarding your basic microcontroller assembly Program to your instructor

K.11. you arrive in class on time

K.12. you listen attentively during class

L. Analyze microcontroller serial communications

You will demonstrate your competence:

L.1. by submitting a microcontroller serial communications problem set completed independently and by the due date

L.2. by defending a microcontroller serial communications program set completed independently and by the due date

L.3. by answering a microcontroller serial communications examination completed independently by the due date

L.4. by actively participating in class on the topic of microcontroller serial communications

Your performance will be successful when:

L.1. Microcontroller serial communications problem set must include the correct answer

L.2. Microcontroller serial communications problem set must be clearly written

L.3. Microcontroller serial communications problem set is neatly presented

L.4. Microcontroller serial communications program set must compile without errors

L.5. Microcontroller serial communications program set must successfully execute

L.6. Microcontroller serial communications program set must yield the correct solutions

L.7. Microcontroller serial communications program set defense questions are answered in detail

L.8. Microcontroller serial communications examination must exceed the minimum passing grade

L.9. you explain your microcontroller serial communications Program to your instructor

L.10. you answer questions regarding your microcontroller serial communications

Program to your instructor

L.11. you arrive in class on time

L.12. you listen attentively during class

M. Program a microcontroller based application

You will demonstrate your competence:

M.1. by by competing in the Autonomous Block Retrieval Robot Competition

M.2. by submitting an Autonomous Block Retrieval Robot Competition Final Report by the due date

M.3. by submitting Autonomous Block Retrieval Robot Competition weekly report by the due date

M.4. by actively participating in class on the topic of The Autonomous Block Retrieval Robot Competition

Your performance will be successful when:

M.1. Autonomous Block Retrieval Robot smoothly navigate the track

M.2. Autonomous Block Retrieval Robot returns the block to the beginning of the track

M.3. Autonomous Block Retrieval Robot retrieves the block at the end of the track

M.4. Autonomous Block Retrieval Robot stops at the end of the first full cycle

M.5. Autonomous Block Retrieval Robot utilizes sensors to navigate the track

M.6. Autonomous Block Retrieval Robot is returned in its entirety at the end of the semester

M.7. Autonomous Block Retrieval Robot Final Report includes pictures of the designed robot

M.8. Autonomous Block Retrieval Robot Final Report is clearly written

M.9. Autonomous Block Retrieval Robot Final Report is neatly presented

M.10. Autonomous Block Retrieval Robot Final Report is typed using your software of choice

M.11. Autonomous Block Retrieval Robot weekly progress report includes all progress made on your project for the current week

M.12. Autonomous Block Retrieval Robot weekly progress report includes a list of the tasks accomplished and by which member of the group

M.13. you arrive in class on time

M.14. you listen attentively during class