

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY
SAULT STE. MARIE, ON

COURSE OUTLINE
ELECTRICAL APPRENTICESHIP
ELECTRONIC CONTROLS

COURSE TITLE: ELECTRONIC THEORY

CODE NO.: ELT 901

SEMESTER: _____

PROGRAM: ELECTRICAL APPRENTICESHIP

AUTHOR: RON CHARTRAND

DATE: DEC. 1, 1994

PREVIOUS OUTLINE DATED: _____

W. Filipowich Dec 15/94

APPROVED:

DEAN

L.P. Crockett

DATE

94-12-19

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DIGITAL ELECTRONIC

DIGITAL ELECTRONICS
COURSE NAME

ELT 901
CODE NO.

TOTAL CREDITS 5 5HR / WEEK FOR 8 WEEKS TOTAL 40 HRS

PREREQUISITE(S): COMPLETION OF ADVANCE ELECTRICAL APPRENTICESHIP COURSE

I. PHILOSOPHY/GOALS: This course is a study of the principles and techniques of modern DIGITAL SYSTEMS. The student will gain an understanding of numbering systems, digital components and digital circuits.

II. STUDENT PERFORMANCE OBJECTIVES (OUTCOMES):

Upon successful completion of this course the student will:

- 1) Distinguish between digital and analog systems**
- 2) Identify logic symbols**
- 3) Identify numbering systems such as BINARY, OCTAL, HEXADECIMAL, and BCD**
- 4) Identify digital components and circuits**
- 5) Troubleshoot simple digital circuits**
- 6) Understand the operation of analog to digital and digital to analog converters**
- 7) Understand the operation of phase locked loops**
- 8) Understand the operation of sequencers, shift registers, counters, and flip flop circuits**
- 9) Distinguish and troubleshoot Flip Flop Applications**
- 10) Demonstrate logic gate applications and interfacing using standard gate components**
- 11) Understand the operation of decoders and encoders in various circuit applications**
- 12) Distinguish TTL and CMOS devices**
- 13) Understand the principles in TTL and CMOS circuits**
- 14) Understand serial to parallel and parallel to series conversions**

III. TOPICS TO BE COVERED: approximate Time (include lab or demonstration time)

- | | |
|--|-------|
| 1) Overview of Digital Logic Systems and IC components | 1/2hr |
| 2) Introduction to Boolean Algebra | 1 hr |
| 3) Introduction to logic symbols | 1 hr |
| 4) Introduction to numbering systems such as BINARY, OCTAL, HEXADECIMAL, and BCD | 1/2hr |
| 5) Digital components and circuits | 3 hr |
| 6) Troubleshoot simple digital circuits | 6 hr |
| 7) TTL and CMOS devices and circuits | 4 hr |
| 8) Flip Flop circuits and troubleshooting | 4 hr |
| 9) TTL counters, registers, and sequencers | 5 hr |
| 10) A To D and D to A conversion | 3 hr |
| 11) Phase locked loops operation | 3 hr |
| 12) Decoders and encoders operation | 3 hr |
| 13) Logic gate applications and interfacing using standard gate components | 3 hr |
| 14) Serial to parallel and parallel to series conversions | 3 hr |

NOTE:

These times include theory, lab and tests for this course.

DIGITAL ELECTRONICS
COURSE NAME

ELT 901
CODE NO.

IV. LEARNING ACTIVITIES/REQUIRED RESOURCES

Topic/Unit -1) Overview of Digital Logic Systems and IC components

Learning Activities:

Listen to presentation on IC component identification and specifications.

Also discuss digital logic systems.

Participate in question / answer time for this topic

Resources:

Overheads, handouts, and VHS tape.

Topic/Unit: 2) Introduction to Boolean Algebra

Learning Activities:

Listen to presentation on Boolean Algebra and its application.

Participate in solving basic Boolean Algebra questions.

Participate in question / answer time for this topic

Resources:

Chalkboard, overheads and handouts.

Topic/Unit: 3) Introduction to logic symbols

Learning Activities:

Listen to presentation on logic symbol identification and its terminology.

Practice drawing symbols

Participate in question / answer time for this topic

Resources:

Chalkboard, overheads and handouts.

Topic/Unit: 4) Introduction to numbering systems

Learning Activities:

- Listen to presentation on numbering system identification and its terminology.**
- Practice counting in the various numbering systems and converting from one to another.**
- Participate in question / answer time for this topic**

Resources:

Chalkboard, overheads and handouts.

Topic/Unit: 5) Digital components and circuits

Learning Activities:

- Listen to presentation on digital component identification and its terminology.**
- Listen to presentation on digital circuit identification and operation.**
- Practice drawing simple logic circuits and identifying them on electronic schematics.**
- Participate in question / answer time for this topic**
- Participate in lab activities related to this topic**

Resources:

Chalkboard, overheads and handouts.

Lab equipment and material

Topic/Unit: 6) Troubleshoot simple digital circuits

Learning Activities:

- Listen to presentation on digital component troubleshooting techniques.**
- Listen to presentation on digital circuit testing equipment identification and operation.**
- Practice using digital test equipment.**
- Participate in question / answer time for this topic**
- Participate in lab activities related to this topic**

Resources:

Chalkboard, overheads and handouts.

Lab equipment and material

Topic/Unit: 7) TTL and CMOS devices and circuits

Learning Activities:

Listen to presentation on TTL and CMOS devices and circuits.

Listen to presentation on care with handling CMOS IC.

Participate in question / answer time for this topic

Resources:

Chalkboard, overheads and handouts.

Topic/Unit: 8) Flip Flop circuits and troubleshooting

Learning Activities:

Listen to presentation on flip flop types and operation.

Listen to presentation on flip flop circuits and troubleshooting techniques

Participate in question / answer time for this topic

Participate in lab activities related to this topic

Resources:

Chalkboard, overheads and handouts.

Lab equipment and material

Topic/Unit: 9) TTL counters, registers, and sequencers

Learning Activities:

Listen to presentation on TTL counter, register, and sequencer operation

Participate in question / answer time for this topic

Participate in lab activities related to this topic

Resources:

Chalkboard, overheads and handouts.

Lab equipment and material

Topic/Unit: 10) A To D and D to A conversion

Learning Activities:

Listen to presentation on A to D and D to A conversion circuit operation and use

Participate in question / answer time for this topic

Participate in lab activities related to this topic

Resources:

Chalkboard, overheads and handouts.

Lab equipment and material.

Topic/Unit: 11) Phase locked loops operation

Learning Activities:

Listen to presentation on phase locked loop operation and use.

Participate in question / answer time for this topic

Participate in lab activities related to this topic

Resources:

Chalkboard, overheads and handouts.

Lab equipment and material

Topic/Unit: 12) Decoders and encoders operation

Learning Activities:

Listen to presentation on decoder and encoder operation and use.

Participate in question / answer time for this topic

Participate in lab activities related to this topic

Resources:

Chalkboard, overheads and handouts.

Lab equipment and material

Topic/Unit: 13) Logic gate applications and interfacing

Learning Activities:

Listen to presentation on logic gate application and interfacing

Participate in question / answer time for this topic

Participate in lab activities related to this topic

Resources:

Chalkboard, overheads and handouts.

Lab equipment and material.

Topic/Unit: 14) Serial to parallel and parallel to series conversions

Learning Activities:

Listen to presentation on serial to parallel and parallel to serial conversions

Participate in question / answer time for this topic

Resources:

Chalkboard, overheads and handouts.

DIGITAL ELECTRONICS
COURSE NAME

ELT 901
CODE NO.

V. EVALUATION METHODS:

MAY INCLUDE WRITTEN TESTS, PRACTICAL TESTS, ASSIGNMENTS, QUIZZES, ATTENDANCE REQUIREMENTS, ETC.) Your instructor reserves the right to use all, or a selection of the above mentioned evaluation methods.

A final grade will be derived as follows:

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|--|------------|
| All written tests for theory portion of course May include quizzes or oral testing at the discretion of the instructor. | 40% |
|--|------------|

| | |
|---|------------|
| All assignments, lab written assignments, lab projects and practical tests. Your instructor reserves the right to use all, or a selection of the above mentioned evaluation methods. | 60% |
|---|------------|

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TOTAL 100%

The number and types of written tests and other forms of evaluation will be set by the instructor at the beginning of the Electronic Control Course.

VI. REQUIRED STUDENT RESOURCES: Will be indicated by the instructor at the beginning of the course if he/she deems one necessary.

VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY:

Book Section (TITLE, PUBLISHER, EDITION, DATE, LIBRARY CALL NUMBER IF APPLICABLE) Will be indicated by the instructor at the beginning of the course if he/she deems it necessary.

VIII. SPECIAL NOTES

Students with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

If a student is absent or misses a test of any kind, he / she will receive a mark of zero (0) for that particular test, unless he / she has made prior arrangements and agreement with the instructor , or the student has a doctor slip indicating that he /she was unable to attend the testing time due to illness.

Your instructor reserves the right to issue a make up test if he / she feels that the situation warrants a make up test, other wise no make up tests will be issued.

Lab attendance is compulsory and is included in the evaluation process.

Your instructor reserves the right to modify the course or change resource presentation material as he/she deems necessary to meet the needs of students.

X. COURSE ANALYSIS SHEET (see attached)

COURSE ANALYSIS FORM

ELECTRICAL APPRENTICESHIP

ELECTRONIC CONTROL

| COURSE TITLE AND NO. ELECTRONIC THEORY ELT 901 DIGITAL ELECTRONICS | | |
|--|---|--|
| LEARNING OUTCOMES | BROAD AREAS OF CONTENT | INDICATORS OF SUCCESS |
| <p>1)- Identify IC components</p> <p>- Understand the use of IC part catalogues</p> | <p>- Theory and practical identification methods</p> <p>- Read IC catalogues and cross references</p> | <p>- Demonstrate the ability to identify IC components in and out of circuits</p> <p>- Demonstrate the skills necessary to cross reference IC components</p> |
| <p>2)- Understand the principles and use of boolean algebra</p> | <p>- Study boolean algebra to digital circuit development</p> | <p>- Adapt simple boolean algebra expressions to develop basic digital circuits</p> |
| <p>3)- Identify logic symbols</p> | <p>- Study logic symbols meanings and physical shapes</p> | <p>- Draw and identify logic symbols</p> |
| <p>4)- Understand and use octal, hex and BCD numbering systems</p> | <p>- Counting, conversions and uses of the different numbering systems</p> | <p>- Distinguish between the different numbering system</p> <p>- Manipulate , and convert numbers from one system to another</p> |
| <p>5)- Follow proper handling procedures and care required to work with TTL and CMOS components</p> | <p>- Theory and practical methods of working with TTL and CMOS components</p> | <p>- Execute proper handling and care techniques for TTL and CMOS components</p> |
| <p>6)- Understand the operation of Flip-Flop circuits and troubleshooting methods for Flip-Flop circuits</p> | <p>- Study Flip-Flop circuits and troubleshooting methods for these circuits</p> | <p>- Demonstrate the ability to assemble simple Flip-Flop circuits and use troubleshooting equipment for these types of circuits</p> |

COURSE ANALYSIS FORM CONTINUED

ELECTRICAL APPRENTICESHIP

| COURSE TITLE AND NO. ELECTRONIC THEORY ELT 901 DIGITAL ELECTRONICS | | |
|---|---|---|
| LEARNING OUTCOMES | BROAD AREAS OF CONTENT | INDICATORS OF SUCCESS |
| 7)- Understand the use and basic operation of TTL counters, registers and sequencers | - Study the basic operation and use of TTL counters, registers and sequencers | - Explain the basic operation of TTL counters , registers and sequencer circuits - Differentiate between the uses and applications of the circuit mentioned above |
| 8)- Understand the use and basic operation of A to D and D to A circuits | - Study the basic operation and use of A to D and D to A circuits | - Explain the basic operation of A to D and D to A circuits - Differentiate between the uses and applications of the circuit mentioned above |
| 9)- Understand the basic operation of Phase Locked Loops, Decoders, Encoders circuits | - Study the basic operation and use of Phase Locked Loops, Decoders, and Encoder circuits | - Explain the basic operation of Phase Locked Loops, Decoders, and Encoder circuits - Differentiate between the uses and applications of the circuit mentioned above |
| 10)- Identify Serial and Parallel connection and their use - Understand the basic operation and conversion between serial and parallel | -Study serial to parallel and parallel to serial basic conversions | - Recall the uses of serial to parallel and parallel to serial circuits - Recall the advantages and disadvantages of the above mentioned circuits |

ASSESSMENT PROCESS

ASSESSMENT TOOLS

SUPPORTS

REQUIREMENTS FOR SUCCESSFUL COMPLETION

SIGNATURES:

PROFESSOR

PROGRAM COORDINATOR OR DEAN

DATE

DATE

FIBRE OPTICS

FIBRE OPTICS
COURSE NAME

TOTAL CREDITS : 3 HRS/ WEEK FOR 3 WEEKS TOTAL 9 HRS

PREREQUISITE: COMPLETION OF ADVANCE ELECTRICAL SYSTEMS COURSE

LEARNING OBJECTIVES: This course is a study of the principles and techniques of modern FIBRE OPTIC SYSTEMS. The student will gain an understanding of fibre optic components, wiring and wiring techniques.

II. COURSE PERFORMANCE OBJECTIVES (OUTCOMES):

Upon successful completion of this course the student will:

- 1) Identify the basic operation of fibre optic components and circuits.
- 2) Identify fibre optic components and Cable types.
- 3) Demonstrate the proper methods of fibre optic cable termination and splicing.
- 4) Identify and demonstrate the use of specialized fibre optic splicing and testing equipment.
- 5) Troubleshoot simple fibre optic circuits.
- 6) Understand the operation of fibre optic LOCAL AREA NETWORKS including physical layer and Networking.
- 7) Understand fibre optic protocols.
- 8) Basic understanding of Section 24 of the Canadian Electric Code 1981 edition.

FIBRE OPTICS

FIBRE OPTICS
COURSE NAME

ELT 901
CODE NO.

TOTAL CREDITS 3 3 HRS / WEEK FOR 8 WEEKS TOTAL 24 HRS

PREREQUISITE(S): COMPLETION OF ADVANCE ELECTRICAL
APPRENTICESHIP COURSE

I. PHILOSOPHY/GOALS: This course is a study of the principles and techniques of modern FIBRE OPTIC SYSTEMS. The student will gain an understanding of fibre optic components, wiring and wiring techniques.

II. STUDENT PERFORMANCE OBJECTIVES (OUTCOMES):

Upon successful completion of this course the student will:

- 1) Understand the basic operation of fibre optic components and circuits.
- 2) Identify Fibre Optic components and Cables types .
- 3) Demonstrate the proper methods of fibre optic cable terminating and splicing
- 4) Identify and demonstrate the use of specialized fibre optic splicing and testing equipment
- 5) Troubleshoot simple fibre optic circuits
- 6) Understand the operation of fibre optic LOCAL AREA NETWORKS including Multiplexing and Demultiplexing.
- 8) Understand fibre optic protocols
- 9) Basic understanding of Section 56 in the Canadian Electric Code 1994 edition

III. TOPICS TO BE COVERED: approximate Time (include lab or demonstration time)

- | | |
|---|--------------|
| 1) Basic operation of fibre optic components and circuits. | 4 hr |
| 2) Fibre Optic systems and Cable types | 2 hr |
| 3) Fibre optic cable terminating and splicing and the use of special equipment | 12 hr |
| 4) Troubleshooting simple fibre optic circuits | 2 hr |
| 5) Fibre optic LOCAL AREA NETWORKS including Multiplexing and Demultiplexing. | 2 hr |
| 6) Fibre optic protocols and CSA codes | 2 hr |

NOTE:**Times include theory, labs and tests.****TOTAL 24 hrs**

FIBRE OPTICS
COURSE NAME

ELT 901
CODE NO.

IV. LEARNING ACTIVITIES/REQUIRED RESOURCES

Topic/Unit -1) Basic operation of fibre optic components and circuits.

Learning Activities:

Listen to presentation on the operation of Fibre Optic circuits and components.

Discus use of Fibre Optic circuits

Participate in question / answer time for this topic

Resources:

Handouts, Overheads, and Chalkboard

Lab equipment and material

Topic/Unit: 2) Fibre Optic systems and Cable types

Learning Activities:

Listen to presentation on the operation of Fibre Optic systems and cable types.

Discus use of Fibre Optic systems

Participate in question / answer time for this topic

Resources:

Overheads, Handouts and demo material

Lab equipment and material

Topic/Unit: 3) Fibre optic cable terminating and splicing and the use of special equipment

Learning Activities:

Listen to presentation on the operation of Fibre Optic circuits and components.

Discus use of Fibre Optic systems

Demonstrate proper use of fibre optic test equipment

Demonstrate proper termination and splicing techniques

Practice making proper terminations and splices in fibre optic cables

Practice using fibre optic test equipment

Participate in question / answer time for this topic

Resources:

Overheads, Handouts, VHS tape and demo material

Lab equipment and material

Topic/Unit: 4) Troubleshooting simple fibre optic circuits

Learning Activities:

Listen to presentation on troubleshooting simple Fibre Optic circuits and components.

Discus use of Fibre Optic systems troubleshooting techniques.

Demonstrate proper use of fibre optic troubleshooting equipment

Demonstrate proper troubleshooting techniques

Practice troubleshooting simple fibre optic circuits

Practice using fibre optic troubleshooting equipment

Participate in question / answer time for this topic

Resources:

Overheads, Handouts and demo material

Lab equipment and material

Topic/Unit: 5) Fibre optic LOCAL AREA NETWORKS including Multiplexing and Demultiplexing

Learning Activities:

- Listen to presentation on Fibre Optic LAN.**
- Discus use of Fibre Optic LAN systems**
- Participate in question / answer time for this topic**

Resources:

Overheads, and Handouts

Topic/Unit: 6) Fibre optic protocols and CSA codes

Learning Activities:

- Listen to presentation on Fibre Optic protocols.**
- Discus Section 56 Fibre Optic of the Canadian Electric Code (CSA) 1994 edition**
- Participate in question / answer time for this topic**

Resources:

Overheads, and Handouts

FIBRE OPTICS
COURSE NAME

ELT 901
CODE NO.

V. EVALUATION METHODS:

MAY INCLUDE WRITTEN TESTS, PRACTICAL TESTS, ASSIGNMENTS, QUIZZES, ATTENDANCE REQUIREMENTS, ETC.) Your instructor reserves the right to use all, or a selection of the above mentioned evaluation methods.

A final grade will be derived as follows:

| | |
|--|-----|
| All written tests for theory portion of course May include quizzes or oral testing at the discretion of the instructor. | 20% |
|--|-----|

| | |
|--|-----|
| All assignments, lab written assignments, lab projects and practical tests. Your instructor reserves the right to use all, or a selection of the above mentioned evaluation methods. | 80% |
|--|-----|

TOTAL 100%

The number and types of written tests and other forms of evaluation will be set by the instructor at the beginning of the Electronic Control Course.

VI. REQUIRED STUDENT RESOURCES: Will be indicated by the instructor at the beginning of the course if he/she deems one necessary.

VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY:

Book Section (TITLE, PUBLISHER, EDITION, DATE, LIBRARY CALL NUMBER IF APPLICABLE) Will be indicated by the instructor at the beginning of the course if he/she deems it necessary.

VIII. SPECIAL NOTES

Students with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

If a student is absent or misses a test of any kind, he / she will receive a mark of zero (0) for that particular test, unless he / she has made prior arrangements and agreement with the instructor , or the student has a doctor slip indicating that he /she was unable to attend the testing time due to illness.

Your instructor reserves the right to issue a make up test if he / she feels that the situation warrants a make up test, other wise no make up tests will be issued.

Lab attendance is compulsory and is included in the evaluation process.

Your instructor reserves the right to modify the course or change resource presentation material as he/she deems necessary to meet the needs of students.

IX. COURSE ANALYSIS SHEET (see attached)

COURSE ANALYSIS FORM

ELECTRICAL APPRENTICESHIP

ELECTRONIC CONTROL

| COURSE TITLE AND NO. ELECTRONIC THEORY ELT 901 FIBRE OPTICS | | |
|---|--|--|
| LEARNING OUTCOMES | BROAD AREAS OF CONTENT | INDICATORS OF SUCCESS |
| <p>1)- Identify Fibre Optic Components</p> <p>- Understand the basic operation of Fibre Optic circuits</p> | <p>- Theory and practical identification methods</p> <p>- Read catalogues and cross references</p> <p>- Study basic operation of light and fibre optic components and circuits symbols - Theory and practical methods of working with Fibre Optic components</p> | <p>- Demonstrate the ability to identify Fibre optic components in and out of circuits</p> <p>- Demonstrate the skills necessary to cross reference components</p> <p>- Draw and identify symbols</p> <p>- Execute proper handling and care techniques for Fibre Optic components</p> <p>- Demonstrate the ability to assemble simple Fibre Optic circuits and use troubleshooting equipment for these types of circuits</p> |
| <p>2)- Identify different Fibre Optic Cable types and their use</p> | <p>- Theory and practical studies in fibre optic cable types and use</p> | <p>- Distinguish between different types of fibre optic cables and their use</p> <p>- Demonstrate the ability to use fibre optic cables in simple lab experiments</p> |
| <p>3) Participate in Fibre Optic cable termination and splicing activities</p> | <p>- Practical studies in fibre optic cable termination and splicing techniques</p> | <p>- Demonstrate the ability to terminate and splice fibre optic cables</p> |
| <p>4)- Read and have a basic understanding of the code requirement for communication cable installation</p> | <p>- Read section 58 in the Canadian Electrical code book and discuss selected codes</p> | <p>- Locate the code section that pertains to communication cable installation in the Canadian Electrical Code Book</p> |

ASSESSMENT PROCESS

ASSESSMENT TOOLS

SUPPORTS

REQUIREMENTS FOR SUCCESSFUL COMPLETION

SIGNATURES:

PROFESSOR

PROGRAM COORDINATOR OR DEAN

DATE

DATE

DATA COMMUNICATIONS

DATA COMMUNICATION
COURSE NAME

ELT 901
CODE NO.

TOTAL CREDITS 1 1HR / WEEK FOR 8 WEEKS TOTAL 8 HRS

PREREQUISITE(S): COMPLETION OF ADVANCE ELECTRICAL APPRENTICESHIP COURSE

I. PHILOSOPHY/GOALS: This course is a study of the principles and techniques of modern COMMUNICATION SYSTEMS. The student will gain an understanding of communication cables, wiring and wiring techniques.

II. STUDENT PERFORMANCE OBJECTIVES (OUTCOMES):

Upon successful completion of this course the student will:

- 1) Identify communication copper Cables types.
- 2) Demonstrate the proper methods of communication copper cable terminating and splicing
- 3) Identify and demonstrate the use of specialized DATA COMMUNICATION splicing and testing equipment
- 4) Understand copper cable type LOCAL AREA NETWORKS including Multiplexing and Demultiplexing.
- 5) Understand communication protocols
- 6) Understand section 60 of the Canadian Electrical (CSA) Code as it related to this topic

III. TOPICS TO BE COVERED: approximate Time (include lab or demonstration time)

- | | |
|---|-------------|
| 1) Communication copper Cables types. | 1 hr |
| 2) Communication copper cable terminating and splicing | 3 hr |
| 3) Copper cable type LOCAL AREA NETWORKS including Multiplexing and Demultiplexing. | 2 hr |
| 4) Understand communication protocols | 1 hr |
| 5) Section 60 of the Canadian Electric Code | <u>1 hr</u> |

TOTAL 8 hr**NOTE:****These times include theory, demonstrations in lab and tests for this course.**

DATA COMMUNICATION
COURSE NAME

ELT 901
CODE NO.

IV. LEARNING ACTIVITIES/REQUIRED RESOURCES

Topic/Unit - 1) Communication copper Cables types.

Learning Activities:

Listen to presentation on communication copper cable types.

Discuss the types and uses of these cables

Participate in question / answer time for this topic

Resources:

Handouts, Overheads, and Samples of Cables

Topic/Unit: 2) Communication copper cable terminating and splicing

Learning Activities:

Listen to presentation on communication copper cable splicing and termination.

Discuss the types and uses of these splices and terminations

Demonstrate terminating and splicing

Participate in question / answer time for this topic

Resources:

Handouts, Overheads, and Samples of Cables

Splicing and Terminating Equipment and Material

Topic/Unit: 3) Copper cable type LOCAL AREA NETWORKS including Multiplexing and Demultiplexing.

Learning Activities:

Listen to presentation on LAN.

Discuss the types and uses of LANS

Participate in question / answer time for this topic

Resources:

Handouts, and Overheads

Topic/Unit: 4) Understand communication protocols

Learning Activities:

Listen to presentation on communication protocols.

Discuss the types and uses of protocols

Participate in question / answer time for this topic

Resources:

Handouts, and Overheads

Topic/Unit: 5) Section 60 of the Canadian Electric Code

Learning Activities:

Listen to presentation on Section 60 CSA Canadian Electrical Code

Discuss selected codes from section 60

Participate in question / answer time for this topic

Resources:

Handouts, Overheads, and CSA Code Book 1994 edition

DATA COMMUNICATION
COURSE NAME

ELT 901
CODE NO.

V. EVALUATION METHODS:

MAY INCLUDE WRITTEN TESTS, PRACTICAL TESTS, ASSIGNMENTS, QUIZZES, ATTENDANCE REQUIREMENTS, ETC.) Your instructor reserves the right to use all, or a selection of the above mentioned evaluation methods.

A final grade will be derived as follows:

| | |
|--|------------|
| All written tests for theory portion of course May include quizzes or oral testing at the discretion of the instructor. | 80% |
|--|------------|

| | |
|---|------------|
| All assignments, lab written assignments, lab projects and practical tests. Your instructor reserves the right to use all, or a selection of the above mentioned evaluation methods. | 20% |
|---|------------|

TOTAL 100%

The number and types of written tests and other forms of evaluation will be set by the instructor at the beginning of the Electronic Control Course.

VI. REQUIRED STUDENT RESOURCES: Will be indicated by the instructor at the beginning of the course if he/she deems one necessary.

VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY:

Book Section (TITLE, PUBLISHER, EDITION, DATE, LIBRARY CALL NUMBER IF APPLICABLE) Will be indicated by the instructor at the beginning of the course if he/she deems it necessary.

VIII. SPECIAL NOTES

Students with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

Lab attendance is compulsory and is included in the evaluation process.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.

IX. COURSE ANALYSIS SHEET (see attached)

COURSE ANALYSIS FORM

ELECTRICAL APPRENTICESHIP

ELECTRONIC CONTROL

| COURSE TITLE AND NO. ELECTRONIC THEORY ELT 901 DATA COMMUNICATION | | |
|--|--|--|
| LEARNING OUTCOMES | BROAD AREAS OF CONTENT | INDICATORS OF SUCCESS |
| 1)- Identify Communication copper cable types and their use | <ul style="list-style-type: none"> - Theory and practical identification methods - Read catalogues and cross references - Theory and practical studies in communication cable types and use | <ul style="list-style-type: none"> - Demonstrate the ability to identify different communication copper cable types and state their use - Demonstrate the skills necessary to cross reference components |
| 2)- Participate in Communication cable termination and splicing activities | <ul style="list-style-type: none"> - Practical studies in communication cable termination and splicing techniques | <ul style="list-style-type: none"> - Distinguish between different types of communication cables - Demonstrate the proper to use of communication cables - Demonstrate the ability to terminate and splice fibre optic cables |
| 4) - Understand the term LAN and the use of LAN - Understand the basic functions of multiplexing and demultiplexing in Communication networks | <ul style="list-style-type: none"> - Study the use of LAN and meaning of the term LAN - Theoretical study of the basic functions of multiplexing and demultiplexing in communications networks | <ul style="list-style-type: none"> - Recall the term LAN and it applications in communication networks - Explain the basic functions of multiplexing and demultiplexing |
| 5)- Understand the term communications protocol and the basic type used in communication networks | <ul style="list-style-type: none"> - Study of the basic type of communication protocol used | <ul style="list-style-type: none"> - Recall the basic type of communication protocols |
| 6)- Read and have a basic understanding of the code requirement for communication cable installation | <ul style="list-style-type: none"> - Read section 60 in the Canadian Electrical code book and discuss selected codes | <ul style="list-style-type: none"> - Locate the code section that pertains to communication cable installation in the Canadian Electrical Code Book |

ASSESSMENT PROCESS

ASSESSMENT TOOLS

SUPPORTS

REQUIREMENTS FOR SUCCESSFUL COMPLETION

SIGNATURES:

PROFESSOR

PROGRAM COORDINATOR OR DEAN

DATE

DATE

INTRODUCTION TO LASERS

INTRODUCTION TO LASERS
COURSE NAME

ELT 901
CODE NO.

TOTAL CREDITS 1 1HR / WEEK FOR 8 WEEKS TOTAL 8 HRS

PREREQUISITE(S): COMPLETION OF ADVANCE ELECTRICAL
APPRENTICESHIP COURSE

I. PHILOSOPHY/GOALS: This course is a study of the principles and techniques of modern LASER APPLICATIONS The student will gain an understanding of safety, and basic operation.

II. STUDENT PERFORMANCE OBJECTIVES (OUTCOMES):

Upon successful completion of this course the student will:

- 1) Identify laser components**
- 2) Understand laser safety**
- 3) Understand the basic theory and operation of lasers**
- 4) Understand and identify laser applications**

III. TOPICS TO BE COVERED: approximate Time (include lab or demonstration time)

- | | |
|-------------------------------------|-------|
| 1) Laser components | 2 hrs |
| 2) Laser safety | 2 hrs |
| 3) Basic laser theory and operation | 2 hrs |
| 4) Laser applications | 2 hrs |

TOTAL 8 hrs

NOTE:

These times include theory, demonstration labs and tests for this course.

INTRODUCTION TO LASERS
COURSE NAME

ELT 901
CODE NO.

IV. LEARNING ACTIVITIES/REQUIRED RESOURCES

Topic/Unit -1) Laser components

Learning Activities:

Listen to presentation on Laser components

Resources:

Handouts, Overheads, and Chalkboard

Topic/Unit: 2) Laser safety

Learning Activities:

Listen to presentation on Laser safety

Resources:

Handouts, Overheads, and Chalkboard

Topic/Unit: 3) Basic laser theory and operation

Learning Activities:

Listen to presentation on Laser theory and operation.

Resources:

Handouts, Overheads, and Chalkboard

Topic/Unit: 4) Laser applications

Learning Activities:

Listen to presentation on Laser applications.

Resources:

Handouts, Overheads, and Chalkboard

INTRODUCTIONS TO LASERS
COURSE NAME

ELT 901
CODE NO.

V. EVALUATION METHODS:

MAY INCLUDES WRITTEN TESTS, PRACTICAL TESTS, ASSIGNMENTS, QUIZZES, ATTENDANCE REQUIREMENTS, ETC.) Your instructor reserves the right to use all or a selection of the above mentioned evaluation methods.

A final grade will be derived as follows:

| | |
|---|-------------|
| All written tests for theory portion of course may include quizzes or oral testing at the discretion of the instructor. Also written or oral assignments may be used in the evaluation of this course at the discretion of the instructor. | 100% |
| | <hr/> |
| TOTAL | 100% |

The number and types of written tests and other forms of evaluation will be set by the instructor at the beginning of the Electronic Control Course.

VI. REQUIRED STUDENT RESOURCES: Will be indicated by the instructor at the beginning of the course if he/she deems one necessary.

VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY:

Book Section (TITLE, PUBLISHER, EDITION, DATE, LIBRARY CALL NUMBER IF APPLICABLE) Will be indicated by the instructor at the beginning of the course if he/she deems it necessary.

VIII. SPECIAL NOTES

Students with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

If a student is absent or misses a test of any kind, he / she will receive a mark of zero (0) for that particular test, unless he / she has made prior arrangements and agreement with the instructor , or the student has a doctor slip indicating that he /she was unable to attend the testing time due to illness.

Your instructor reserves the right to issue a make up test if he / she feels that the situation warrants a make up test, other wise no make up tests will be issued.

Your instructor reserves the right to modify the course or change resource presentation material as he/she deems necessary to meet the needs of students.

Lab attendance is compulsory and is included in the evaluation process.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.

IX. COURSE ANALYSIS SHEET (see attached)

COURSE ANALYSIS FORM

ELECTRICAL APPRENTICESHIP

ELECTRONIC CONTROL

| COURSE TITLE AND NO. ELECTRONIC THEORY ELT 901 INTRODUCTION TO LASERS | | |
|---|--|--|
| LEARNING OUTCOMES | BROAD AREAS OF CONTENT | INDICATORS OF SUCCESS |
| 1)- Identify Laser components and their use | <ul style="list-style-type: none"> - Theory and practical identification methods - Read catalogues and cross references - Theory in laser types, use and safety | <ul style="list-style-type: none"> - Demonstrate the ability to identify different laser components and state their use - Demonstrate the skills necessary to cross reference components |
| 2)- Understand the basic operation of lasers components | <ul style="list-style-type: none"> - Study of basic operation of laser components | <ul style="list-style-type: none"> - Recall the proper to use of Lasers |
| 3)- Understand the basic functions and application of lasers used measuring and detection equipment | <ul style="list-style-type: none"> - Study of basic applications of laser components | <ul style="list-style-type: none"> - Explain the basic functions and applications of lasers |

ASSESSMENT PROCESS

ASSESSMENT TOOLS

SUPPORTS

REQUIREMENTS FOR SUCCESSFUL COMPLETION

SIGNATURES:

PROFESSOR

PROGRAM COORDINATOR OR DEAN

DATE

DATE

INDUSTRIAL COMPUTER SYSTEMS

INDUSTRIAL COMPUTER SYSTEMS
COURSE NAME

ELT 901
CODE NO.

TOTAL CREDITS 5 5HR / WEEK FOR 8 WEEKS TOTAL 40 HRS

PREREQUISITE(S): COMPLETION OF ADVANCE ELECTRICAL APPRENTICESHIP COURSE

I. PHILOSOPHY/GOALS: This course is a study of the principles and techniques of modern INDUSTRIAL COMPUTER SYSTEMS. The student will gain an understanding of basic operation and applications.

II. STUDENT PERFORMANCE OBJECTIVES (OUTCOMES):

Upon successful completion of this course the student will:

- 1) Identify INDUSTRIAL COMPUTER SYSTEMS components**
- 2) Understand Supervisory Control and Data Acquisition (SCADA) systems.**
- 3) Understand the basic theory and operation of Distributed Control Systems (DCS)**
- 4) Understand Computer Based Interactive Control System in connection with PLCs**
- 5) Understand Computer Aided Drawings and Graphic used in conjunction with Control Systems**

III. TOPICS TO BE COVERED: approximate Time (include lab or demonstration time)

| | |
|---|---------------------|
| 1) INDUSTRIAL COMPUTER SYSTEMS components | 2 hrs |
| 2) Theory and operation of Supervisory Control and Data Acquisition (SCADA) systems. | 2 hrs |
| 3) SCADA application | 2 hrs |
| 4) Theory and operation of Distributed Control Systems (DCS) | 3 hrs |
| 5) DCS applications | 2 hrs |
| 6) DATA Highway PLUS & MODBUS PLUS as Distributed Control Systems | 6 hrs |
| 7) INFI 90 as a Distributed Control System | 6 hrs |
| 8) Computer Based Interactive Control System in connection with PLCs | 3 hrs |
| 9) Panelview and Controlview as interactive control systems | 8 hrs |
| 10) ABIntelligent terminal as interactive control system | <u>6 hrs</u> |
| | TOTAL 40 hrs |

NOTE:

These times include theory, lab and tests for this course.

INDUSTRIAL COMPUTER SYSTEMS
COURSE NAME

ELT 901
CODE NO.

IV. LEARNING ACTIVITIES/REQUIRED RESOURCES

Topic/Unit - 1) Industrial Computer Systems Components

Learning Activities:

Listen to presentation on Industrial Computer Systems and their components

Discuss the use of industrial computer systems and how they relate to the electrical trade

Participate in questions / answer time for the topic

Resources:

Handouts, Overheads, Chalkboard

Lab Equipment and Material

Topic/Unit: 2) Theory and operation of Supervisory Control and Data Acquisition (SCADA) systems.

Learning Activities:

Listen to presentation on SCADA Systems and their components

Participate in questions / answer time for the topic

Resources:

Handouts, Overheads, Chalkboard

Lab Equipment and Material

Topic/Unit - 3) SCADA application

Learning Activities:

Listen to presentation on SCADA system applications

Discuss the use of SCADA systems and how they relate to the electrical trade

Participate in questions / answer time for the topic

Resources:

Handouts, Overheads, Chalkboard

Lab Equipment and Material

Topic/Unit -4)Theory and operation of Distributed Control Systems (DCS)

Learning Activities:

Listen to presentation on Distributed Control Systems and their components

Discuss the use of industrial computer systems and how they relate to the electrical trade

Participate in questions / answer time for the topic

Resources:

Handouts, Overheads, Chalkboard

Lab Equipment and Material

Topic/Unit - 5) DCS applications

Learning Activities:

Listen to presentation on Distributed Control Systems applications

Discuss the use of distributed control systems and how they relate to the electrical trade

Participate in questions / answer time for the topic

Resources:

Handouts, Overheads, Chalkboard

Lab Equipment and Material

Topic/Unit - 6) DATA Highway PLUS & MODBUS PLUS as Distributed Control Systems

Learning Activities:

Listen to presentation on DCS Systems such as Allen Bradley's Data Highway and Modicon's Modbus Plus systems.

Discuss the use of these systems and how they relate to the control of equipment

Participate in questions / answer time for the topic

Participate in lab activities related to this topic

Resources:

Handouts, Overheads, Chalkboard

Lab Equipment and Material

Topic/Unit - 7) INFI 90 as a Distributed Control System

Learning Activities:

Listen to presentation on INFI 90 as a DCS Systems and related components

Discuss the use of INFI 90 and how they relate to control of equipment

Participate in questions / answer time for the topic

Participate in lab activities related to this topic

Resources:

Handouts, Overheads, Chalkboard

Lab Equipment and Material

Topic/Unit - 8) Computer Based Interactive Control System in connection with PLCs

Learning Activities:

Listen to presentation on Computer Based Interactive Control Systems and their components

Discuss the use of these systems and how they relate to the electrical trade

Participate in questions / answer time for the topic

Resources:

Handouts, Overheads, Chalkboard

Lab Equipment and Material

Topic/Unit - 9) Panelview and Controlview as interactive control systems

Learning Activities:

Listen to presentation on Panelview and Controlview as interactive control Systems and their components

Discuss the use of these systems and how they relate to control of equipment

Participate in questions / answer time for the topic

Participate in lab activities related to this topic

Resources:

Handouts, Overheads, Chalkboard

Lab Equipment and Material

Topic/Unit - 10) ABIntelligent terminal as interactive control system

Learning Activities:

Participate in lab activities related to this topic

Resources:

Handouts, Overheads, Chalkboard

Lab Equipment and Material

INDUSTRIAL COMPUTER SYSTEMS
COURSE NAME

ELT 901
CODE NO.

V. EVALUATION METHODS:

MAY INCLUDE WRITTEN TESTS, PRACTICAL TESTS, ASSIGNMENTS, QUIZZES, ATTENDANCE REQUIREMENTS, ETC.) Your instructor reserves the right to use all, or a selection of the above mentioned evaluation methods.

A final grade will be derived as follows:

All written tests for theory portion of course 20%
May include quizzes or oral testing at the discretion of the instructor.

All assignments, lab written assignments, lab projects and practical tests. Your instructor reserves the right to use all, or a selection of the above mentioned evaluation methods. 80%

TOTAL 100%

The number and types of written tests and other forms of evaluation will be set by the instructor at the beginning of the Electronic Control Course.

ELECTRICAL APPRENTICESHIP GRADING:

A--85 TO 100%
B--75 TO 84%
C--60 TO 74%
D--55 TO 59%
F-- UNDER 55% FAIL

ELECTRONIC CONTROLS IS AN EIGHT WEEK COURSE WITH 30 HOURS PER WEEK INSTRUCTION.

THEIR ARE TWO REPORTABLE SUBJECT WHICH CONTAIN ALL THE AREAS OF INSTRUCTION AS OUTLINED BELOW AND THEIR OVERALL MARK %.

REPORTABLE COURSE #ELN 901 COMMUNICATION & COMPUTERS SYSTEMS

| | | | |
|-------------------|---|--------------|-------------|
| CONTAINS : | (1) DIGITAL ELECTRONICS THEORY AND LAB | 5HRS | 33% |
| | (2) FIBRE OPTICS THEORY AND LAB | 3HRS | 20% |
| | (3) DATA COMMUNICATIONS | 1HRS | 7% |
| | (4) LASERS | 1HRS | 7% |
| | (5) INDUSTRIAL COMPUTER CONTROLS | 5HRS | 33% |
| | TOTAL | 15HRS | 100% |

REPORTABLE COURSE # ELN 902 CONTROL & POWER ELECTRONICS

| | | | |
|-------------------|---------------------------------------|--------------|-------------|
| CONTAINS : | (1) DC DRIVES THEORY AND LAB | 5HRS | 33% |
| | (2) AC DRIVES THEORY AND LAB | 5HRS | 33% |
| | (3) PLC CONTROL THEORY AND LAB | 5HRS | 34% |
| | TOTAL | 15HRS | 100% |

VI. REQUIRED STUDENT RESOURCES: Will be indicated by the instructor at the beginning of the course if he/she deems one necessary.

VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY:

Book Section (TITLE, PUBLISHER, EDITION, DATE, LIBRARY CALL NUMBER IF APPLICABLE) Will be indicated by the instructor at the beginning of the course if he/she deems it necessary.

VIII. SPECIAL NOTES

Students with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

Lab attendance is compulsory and is included in the evaluation process.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.

IX. COURSE ANALYSIS SHEET (see attached)

COURSE ANALYSIS FORM

ELECTRICAL APPRENTICESHIP

ELECTRONIC CONTROLS

| COURSE TITLE AND NO. ELECTRONIC THEORY ELT 901 INDUSTRIAL COMPUTERS SYSTEMS | | |
|---|---|--|
| LEARNING OUTCOMES | BROAD AREAS OF CONTENT | INDICATORS OF SUCCESS |
| 1)- Identify Industrial Computer System Components | - Theory and practical identification of Industrial Computer System Components | -Demonstrate the ability to identify Industrial Computer System components |
| 2)- Understand the basic operation and use of a SCADA system | - Study of the basic operation of SCADA systems | -Recall the term SCADA and its basic function |
| 3)- Understand the basic operation and use of a DCS system | - Study of the basic operation of DCS systems | -Recall the basic operation of a DCS system |
| 4)- Understand the use of Data Highway Plus and Modbus Plus as DCS systems | - Theory and practical identification of Data Highway Plus and Modbus Plus as DCS systems | -Explain the basic concepts of DCS systems such as Data High Plus and Modbus Plus systems |
| 5)- Understand the use of INFI 90 as a DCS system | - Theory and practical identification of INFI 90 as DCS systems | -Explain the basic concepts of DCS system such as INFI 90 |
| 6)- Understand the use of computer based interactive control systems in relationship to PLC control | - Study the use of computer based interactive control systems | -Demonstrate the use of interactive control systems in the lab |
| 7)- Understand the use of Panelview and Controlview as interactive control systems | - Practical uses of Panelview as a interactive control system | -Demonstrate the use of a panelview as an interactive control system |
| 8)- Understand the use of AB-Intellegent terminal as an interactive control system | - Practical uses of AB-Intellegent terminal software as an interactive control system | -Demonstrated the use of AB-Intellegent terminal software as an interactive control system |

ASSESSMENT PROCESS

ASSESSMENT TOOLS

SUPPORTS

REQUIREMENTS FOR SUCCESSFUL COMPLETION

SIGNATURES:

PROFESSOR

PROGRAM COORDINATOR OR DEAN

DATE

DATE

**ELECTRICAL APPRENTICESHIP ELECTRONIC CONTROLS
 MARK SHEET FOR ELECTRONIC THEORY ELT 901**

| STUDENT'S NAME | DIGITAL MARK OUT OF 33 | FIBRE MARK OUT OF 20 | DATA COM MARK OUT OF 7 | LASERS MARK OUT OF 7 | IND. COMP. MARK OUT OF 33 | TOTAL MARK OUT OF 100 | FINAL GRADE LETTER |
|-------------------|---------------------------------|-------------------------------|------------------------------------|-------------------------------|---------------------------------------|--------------------------------|--------------------------|
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| AVERAGES | | | | | | | |

ROOMS THAT ARE REQUIRED FOR THE ABOVE MENTIONED SUBJECTS

| | | |
|----------------------------|-------------|--|
| DIGITAL ELECTRONICS | 5 hr | 2 hr THEORY ANY ROOM THAT HOLDS 20 STUDENTS |
| | | 3 hr LAB B1010 OR B1020 |
| FIBRE OPTICS | 3 hr | 3 hr LAB B1010 OR B1020 |
| DATA COMMUNICATION | 1 hr | 1 hr LAB B1010 OR B1020 |
| LASER | 1 hr | 1 hr LAB B1010 OR B1020 |
| INDUSTRIAL COMPUTER | 5 hr | 2 hr THEORY ANY ROOM THAT HOLDS 20 STUDENTS |
| | | 3 hr LAB B1040 |