VALLEY ROP COURSE OUTLINE

COURSE TITLE: **Digital Electronics**

VALLEY ROP #: EgD-5574-DigElec
CDE #: 1305

CBEDS TITLE: Electronics Technology
CBEDS #: 5574

CTE SECTOR: Engineering & Design
CTE PATHWAY: Engineering Technology

JOB TITLES:

Office & Admn. Support Workers, all others	43-9199.00
Mechanical Engineering	17-3027.00
Millwrights	49-9044.00
Electrical Engineer	17-2071.00

COURSE DESCRIPTION:
Digital Electronics is an introductory electronics course covering Basic Electron Theory, Engineering Notation, Resistors, Analog and Digital Waveforms, Number systems, Conversions, Logic Gates, Boolean Algebra, Combination Circuit Design, Flip-Flops, Shift Registers and Counters, Logic Families and Specifications, and Microprocessors. The course if project-based according to Project Lead the Way (PLTW) curricula and is aligned with the Accreditation Board for Engineering and Technology Standards (ABET) (industry standard).

DATE APPROVED:
REVISED DATE(S): March 2009 / Oct 2009

HOURS: 180
CREDITS: 10

PREREGUISITES: Algebra I / Geometry

GRADE LEVEL: 11-12

TEXTBOOK: Project Lead the Way Curricula

RESOURCES: Software: EMP Device Programmer Software – EMP1, WIN CUPL, Microsoft Word, Microsoft PowerPoint

COURSE COMPETENCIES:
Upon completion of this course, the student will:

- Knowledge and functional application of basic digital electronics theories and skill.
- Proficient with technologies and strategies used to gather, organize, document, and disseminate information.
- Consideration of the ethical, environmental, social, and economic impacts of the engineering design process is essential to being a responsible, involved citizen.
- Understanding of Mathematics that underlie natural scientific principles and application of these principles to produce products and provide services.
- Contributions to groups that facilitate the solving complex problems and achievement of common goals.
- Application of problem-solving techniques.
- Analyze and solve problems through the use of design process to improve qualify and speed of new products.
- Problem identification, planning, and allocation of resources.
- Ability to self-evaluate.
- Achievement of ABET Standards.

INSTRUCTIONAL METHODS:

- Programmed Instruction
- Concepts
- Performance Objectives aligned with Math, Science and Technology National Standards
- Anticipatory Set
- Key Terms
- Key Questions
- Activity Guide

EVALUATION METHODS:
Assessment opportunities, which allow continuous evaluation of students' progress, will be embedded throughout the course and should be a learning experience. All students will be expected to achieve mastery of all topics; often, demonstrations of mastery will occur in a public forum. The following strategies, which include both formal and informal assessment techniques will include, but are not limited to:

- Academic Prompts resulting in either a written or oral response from students.
- Checklists used to document student work.
- Computerized Assessments used to identify student concerns and abilities regarding particular concepts.
- Concept Mapping will be used to demonstrate a student's reasoning process.
- Demonstrations and presentations required to communicate students' understanding of key principles and concepts.
- Tests and quizzes will be administered to determine level of master of various concepts.
- Portfolios required for documentation, quizzes, notes, etc.

COURSE OUTLINE:

Unit of Instruction	**Estimated Hours**
Fundamentals	**12**

- Safety
  - Electrical
  - Equipment
  - Hand Tools
  - Clothing
  - Procedures
  - Material Safety Data
- Basic Electron Theory
  - Current Flow
    - Conventional vs. Electron Flow
    - DC
    - AC
  - Structure of Atoms
    - Nucleus
    - Protons
    - Electrons
    - Electron Orbi
- Prefixes, Engineering Notation
  - Mega
  - Kilo
  - milli
  - micro
  - micro-micro
  - nano
  - pico
- Resistors
  - Theory
  - Units
    - Ohms
    - Wattage
  - Fixed
  - Color Code
  - Measuring Resistance
  - Variable
- Laws
  - Circuits
  - Parts to Simple Circuit
    - Source
    - Load
    - Control
    - Conductor
  - Schematics
  - Series
  - Parallel
  - Series—Parallel
  - Open/closed Loop

- Switches
  - Single Pole Single Throw
  - Single Pole Double Throw
  - Push Button Normally Closed
  - Push Button Normally Closed
- Short Circuit
- Continuity

- Ohm's Law
  - Measuring Voltage
  - Measuring Current
- Kirchhoff's Law
  - Current
  - Voltage
- Voltage
  - In Series
  - In Parallel
- Current
  - In Series
  - In Parallel
- Resistance
  - In Series
  - In Parallel
- Capacitance
  - Theory
  - Reading the Value
  - Units
    - Farads
    - Voltage
  - Type
    - Ceramic
    - Electrolytic
  - Polarity
  - Measuring
    - Scope
      - Time
      - Voltage
    - Capacity Checker
- Analog and Digital Waveforms
  - Reading Waveforms
    - Signal Generator
    - Wave Types
      - Square
      - Sine
      - Sawtooth
    - Period/Wavelength
      - Amplitude
      - Rise and Fall Time
      - Offset
      - Pulse Width
      - Duty Cycle
      - Calculating Frequency

Logic conditions
High
Low
Multivibrators

- Obtaining Data Sheets
  - Internet Search
  - Information Included

Number Systems **8**

- Conversions
  - Binary to Decimal
  - Decimal to Binary
  - Hexadecimal to Binary
  - Binary to Hexadecimal
  - Hexadecimal to Decimal
  - Decimal to Hexadecimal

Gates **8**

- Logic Gates
  - Logic Symbols for AND, OR, NOT, NAND, NOR Gates
  - Reading Pin-out Diagram
  - Truth Tables
    - Boolean Expression
    - Creating Multiple Input Gates

Boolean algebra **12**

- Boolean Expressions
  - Boolean Expressions and Truth Tables
  - Minterm Expressions, Sum of Products
  - Maxterm Expressions, Product of Sums
  - Unsimplified Boolean Expression and Schematic Circuits
- Logic Simplifications
  - Boolean Simplification
  - DeMorgan's Theorems
  - Karnaugh Mapping
  - Electronic Simplification Tools
- Duality of Logic Functions
  - Using NOR Gates to Emulate All Logic Functions
  - Using NAND Gates to Emulate All Logic Functions

Combinational Circuit Design **20**

- Paradigm for Combinational Logic Problems
  - Word Problem
  - Construct Truth Table
  - Create a Logic Equation from a Truth Table
  - Simplify the Logic Equation
  - Simulate the Circuit
  - Construct the Circuit
  - Troubleshoot
- Specific Application MSI Gates
  - Levels of Integration (SSI, MSI, LSI)
  - Display Drivers

Code Converters
Binary Coded Decimal (BCD)
BCD to Decimal
Decimal to BCD
Binary to Hexadecimal

- Programmable Logic Devices (PLD)
  Introduction to PLD
  PLD Programming Software
  PLD Programming Hardware

Adding **10**

- Binary Addition
  2's Complement Notation, Addition and Subtraction
  Exclusive OR and Exclusive NOR Functions
  Half Adder Design
  Full Adder Design
  N Bit Adder Design

Flip-Flops **20**

- Introduction to Sequential Logic
  Latches
  Flip-Flop
  Timing Diagrams
- J-K Flip-Flop
  Operation of J-K Flip-Flop
  Asynchronous Inputs
  Synchronous Inputs
- Triggers
  Positive-Edge Trigger
  Negative-Edge Trigger
  Positive-Level Trigger (Latch)
  Negative Level Trigger (Latch)
- Flip-Flop Timing Considerations
  Setup and Hold Times
  Propagation Delays
  Timing Limitations (Minimum Pulse Width)

- Elementary Applications of Flip-Flops
  Data Storage
  Logic Synchronizing
  Clock Division
  Switch Debouncing

Shift Registers and Counters **20**

- Shift Registers
  Discrete Shift Register
  Integrated Shift Register
- Asynchronous Counters
  Discrete Ripple Counter
  Discrete Modulus-N Ripple Counter
  Integrated Ripple Counter (7493)

- Other MSI Counter
- Synchronous Counters
  - Discrete Up Counter
  - Discrete Down Counter
  - Discrete Modulus-Synchronous Counter
  - Integrated 4-Bit Binary Counter (74163)
  - Integrated 4-Bit Up/Down Counter (74193)

Families and Specifications **10**

- Logic Families
  - CMOS
  - TTL
  - Interfacing Different Logic Families
- Spec Sheets
  - Electronic Sites
  - Voltage Levels
  - Current Levels
  - Fan-out
  - Switching Characteristics—Propagation Delay

Microprocessors **20**

- Microcontrollers
  - Programming
  - Development Tools
  - Output to Sound
  - Output Pins
  - Limitations
  - Input Devices
    - Switches
    - Phototransistors
  - Analog to Digital
    - A to D Converters
    - CaDimium Sulfide Cells
    - Thermistors

- Interfacing with Motors
  - Types of Motors
    - AC
    - DC
    - Stepper
  - Interface Devices
    - Relays
    - H-Bridges

Student Directed Study Topic **35**

- Design Paradigm

Career Preparation Standards **5**

Total Hours **180 Total Hours**

Standards Integrated

Fundamentals

1.1 Safety (2.1, 6.1, 6.2, 8.2, 8.3, 9.1, 10.1, 10.3)

- 1.1.1 Electrical
- 1.1.2 Equipment
- 1.1.3 Hand Tools
- 1.1.4 Clothing
- 1.1.5 Procedures
- 1.1.6 Material Safety Data

Basic Electron Theory (2.1, 2.6, 2.3, 1.4, 1.3, 4.2, 5.1, D1.1, D1.2, D3.1, D3.2, D3.3, D3.4, D3.5, D3.6)

1.2.1 Current Flow

- 1.2.1.1 Conventional vs. Electron Flow
- 1.2.1.2. DC
- 1.2.1.3 AC

1.2.2 Structure of Atoms

- 1.2.2.1 Nucleus
- 1.2.2.2 Protons
- 1.2.2.3 Electrons
- 1.2.2.4 Electron Orbit

Prefixes, Engineering Notation (Math 1.1, 1.2, 1.6, 2.5, Alg 1 1.1, Sci. 1.2.1.a, 1.2.1.d)

- 1.3.1 Mega
- 1.3.2 Kilo
- 1.3.3 milli
- 1.3.4 micro
- 1.3.5 micro-micro
- 1.3.6 nano
- 1.3.7 pico

Resistors (D3.1, D3.2, D3.3, D3.4, D3.5, D3.6, D3.8, Reading, 2.1, Writing 1.4, 2.3(1.1, 1.2))

- 1.4.1 Theory
- 1.4.2 Units
  - 1.4.2.1 Ohms
  - 1.4.2.2 Wattage
- 1.4.3 Fixed
- 1.4.4 Color Code
- 1.4.5 Measuring Resistance
- 1.4.6 Variable

Laws (Writing 2.2(1.4), D3.8D7.3, D8.7, D11.1, D11.2)

- 1.5.1 Circuits
  - 1.5.1.1 Parts to Simple Circuit
    - 1.5.1.1.1 Source
    - 1.5.1.1.2 Load
    - 1.5.1.1.3 Control
    - 1.5.1.1.4 Conductor
  - 1.5.1.2 Schematics
  - 1.5.1.3 Series
  - 1.5.1.4 Parallel
  - 1.5.1.5 Series—Parallel
  - 1.5.1.6 Open/closed Loop

1.5.1.7 Switches
1.5.1.7.1 Single Pole Single Throw
1.5.1.7.2 Single Pole Double Throw
1.5.1.7.3 Push Button Normally Closed
1.5.1.7.4 Push Button Normally Closed
1.5.1.8 Short Circuit
1.5.1.9 Continuity

1.5.2 Ohm's Law
1.5.2.1 Measuring Voltage
1.5.2.2 Measuring Current

1.5.3 Kirchhoff's Law
1.5.3.1 Current
1.5.3.2 Voltage

1.5.4 Voltage
1.5.4.1 In Series
1.5.4.2 In Parallel

1.5.5 Current
1.5.5.1 In Series
1.5.5.2 In Parallel

1.5.6 Resistance
1.5.6.1 In Series
1.5.6.2 In Parallel

1.6 Capacitance (Writing 2.2(1.4), D1.1, D1.3, D3.1, D3.3, D3.5, D3.8, D7.3, D8.7, D11.1, D11.2)

1.6.1 Theory
1.6.2 Reading the Value
1.6.3 Units
1.6.3.1 Farads
1.6.3.2 Voltage
1.6.4 Type
1.6.4.1 Ceramic
1.6.4.2 Electrolytic
1.6.5 Polarity
1.6.6 Measuring
1.6.6.1 Scope
1.6.6.1.1 Time
1.6.6.1.2 Voltage
1.6.6.2 Capaity Checker

1.7 Analog and Digital Waveforms (D3.1, D3.3, D3.5, D3.8, D7.3, D7.4, D8.1, D8.6, D11.3)
1.7.1 Reading Waveforms
1.7.1.1 Signal Generator
1.7.1.2 Wave Types
1.7.1.2.1 Square
1.7.1.2.2 Sine
17.1.2.3 Sawtooth
1.7.1.3 Period/Wavelgenth
1.7.1.4 Amplitude

1.7.1.5 Rise and Fall Time
1.7.1.6 Offset
1.7.1.7 Pulse Width
1.7.1.8 Duty Cycle
1.7.1.9 Calculating Frequency
1.7.2 Logic conditions
1.7.2.1 High
1.7.2.2 Low
1.7.3 Multivibrators
1.8 Obtaining Data Sheets (Reading 2.1, D1.5, D10.1, D10.2)
1.8.1 Internet Search
1.8.2 Iniformation Included

Number Systems

2.1 Conversions (D3.3, D3.5, Math 2.7, 2.8, Alg II 6.0)
2.1.1 Binary to Decimal
2.1.2 Decimal to Binary
2.1.3 Hexadecimal to Binary
2.1.4 Binary to Hexadecimal
2.1.5 Hexadecimal to Decimal
2.1.6 Decimal to Hexadecimal

Gates

3.1 Logic Gates (Writing 2.2(1.4), D1.1, D1.3, D3.1, D3.3, D3.5, D3.8, D7.3, D8.7, D11.1, D11.2)
3.1.1 Logic Symbols for AND, OR, NOT, NAND, NOR Gates
3.1.2 Reading Pin-out Diagram
3.1.3 Truth Tables
3.1.4 Boolean Expression
3.1.5 Creating Multiple Input Gates

Boolean Algebra

4.1 Boolean Expressions (Math 15.0, Alg 1.1, 3.0, 5.0)
4.1.1 Boolean Expressions and Truth Tables
4.1.2 Minterm Expressions, Sum of Products
4.1.3 Maxterm Expressions, Product of Sums
4.1.4 Unsimplified Boolean Expression and Schematic Circuits
4.2 Logic Simplifications (Math 15.0, Alg 1.1, 3.0, 5.0, D5.1, D5.2, D5.3, D5.4, D5.5, D5.6, D5.7)
4.2.1 Boolean Simplification
4.2.2 DeMorgan's Theorems
4.2.3 Karnaugh Mapping
4.2.4 Electronic Simplification Tools
4.3 Duality of Logic Functions (Math 15.0, Alg 1.1, 3.0, 5.0, D5.1, D5.2, D5.3, D5.4, D5.5, D5.6, D5.7)
4.3.1 Using NOR Gates to Emulate All Logic Functions
4.3.2 Using NAND Gates to Emulate All Logic Functions

Combinational Circuit Design

5.1 Paradigm for Combinational Logic Problems (Math 15.0, Alg 1.1, 3.0, 5.0, D5.1, D5.2, D5.3, D5.4, D5.5, D5.6, D5.7)
5.1.1 Word Problem
5.1.2 Construct Truth Table

5.1.3 Create a Logic Equation from a Truth Table
5.1.4 Simplify the Logic Equation
5.1.5 Simulate the Circuit
5.1.6 Construct the Circuit
5.1.7 Troubleshoot

5.2 Specific Application MSI Gates (Math 15.0, Alg 1.1, 3.0, 5.0, D5.1, D5.2, D5.3, D5.4, D5.5, D5.6, D5.7, D9.1, D9.3)
5.2.1 Levels of Integration (SSI, MSI, LSI)
5.2.2 Display Drivers
5.2.3 Code Converters
5.2.3.1.1 Binary Coded Decimal (BCD)
5.2.3.1.1 BCD to Decimal
5.2.3.1.2 Decimal to BCD
5.2.3.1.3 Binary to Hexadecimal

5.3 Programmable Logic Devices (PLD) (Math 15.0, Alg 1.1, 3.0, 5.0, D5.1, D5.2, D5.3, D5.4, D5.5, D5.6, D5.7, D9.1, D9.2, D10.1)
5.3.1 Introduction to PLD
5.3.2 PLD Programming Software
5.3.3 PLD Programming Hardware

Adding

6.1 Binary Addition (Math 15.0, Alg 1.1, 3.0, 5.0, D10.1)
6.1.1 2's Complement Notation, Addition and Subtraction
6.1.2 Exclusive OR and Exclusive NOR Functions
6.1.3 Half Adder Design
6.1.4 Full Adder Design
6.1.5 N Bit Adder Design

Flip-Flops

7.1 Introduction to Sequential Logic (D9.1, D9.2, D9.5, D8.7)
7.1.1 Latches
7.1.2 Flip-Flop
7.1.3 Timing Diagrams

7.2 J-K Flip-Flop
7.2.1 Operation of J-K Flip-Flop
7.2.2 Asynchronous Inputs
7.2.3 Synchronous Inputs

7.3 Triggers (D9.1, D9.2, D9.5, D8.7)
7.3.1 Positive-Edge Trigger
7.3.2 Negative-Edge Trigger
7.3.3 Positive-Level Trigger (Latch)
7.3.4 Negative Level Trigger (Latch)

7.4 Flip-Flop Timing Considerations (D9.1, D9.2, D9.5, D8.7)
7.4.1 Setup and Hold Times
7.4.2 Propagation Delays
7.4.3 Timing Limitations (Minimum Pulse Width)

7.5 Elementary Applications of Flip-Flops (D9.1, D9.2, D9.5, D8.7)
7.5.1 Data Storage
7.5.2 Logic Synchronizing
7.5.3 Clock Division
7.5.4 Switch Debouncing

Shift Registers and Counters

8.1 Shift Registers (D9.1, D9.2, D9.5, D8.7)
8.1.1 Discrete Shift Register

8.1.2 Integrated Shift Register

8.2 Asynchronous Counters (D9.1, D9.2, D9.5, D8.7)

8.2.1 Discrete Ripple Counter

8.2.2 Discrete Modulus-N Ripple Counter

8.2.3 Integrated Ripple Counter (7493)

8.2.4 Other MSI Counter

8.3 Synchronous Counters (D9.1, D9.2, D9.5, D8.7)

8.3.1 Discrete Up Counter

8.3.2 Discrete Down Counter

8.3.3 Discrete Modulus-Synchronous Counter

8.3.4 Integrated 4-Bit Binary Counter (74163)

8.3.5 Integrated 4-Bit Up/Down Counter (74193)

Families and Specifications

9.1 Logic Families (D9.1, D9.2, D9.5, D8.7, D10.1 D10.2, D11.1)

9.1.1 CMOS

9.1.2 TTL

9.1.3 Interfacing Different Logic Families

9.2 Spec Sheets (Reading 2.1, D1.5, D10.1, D10.2)

9.2.1 Electronic Sites

9.2.2 Voltage Levels

9.2.3 Current Levels

9.2.4 Fan-out

9.2.5 Switching Characteristics—Propagation Delay

Microprocessors

10.1 Microcontrollers (D3.7, D8.4, D8.6, D8.7, D11.3)

10.1.1 Programming

10.1.2 Development Tools

10.1.3 Output to Sound

10.1.4 Output Pins

10.1.5 Limitatioins

10.1.6 Input Devices

10.1.6.1 Switches

10.1.6.2 Phototransistors

10.1.7 Analog to Digital

10.1.7.1 A to D Converters

10.1.7.2 CaDimium Sulfide Cells

10.1.7.3 Thermistors

10.2 Interfacing with Motors (D3.1, D3.2, D3.3, D3.4, D4.4)

10.2.1 Types of Motors

10.2.1.1 AC

10.2.1.2 DC

10.2.1.3 Stepper

10.2.2 Interface Devices

10.2.2.1 Relays

10.2.2.2 H-Bridges

Student Directed Study Topic

11.1 Design Paradigm (Writing 2.2, D1.0, D2.0, D3.0, D4.0, D5.0, D6.0, D7.0, D8.0, D9.0, D10.0, D11.0)

CAREER PREPARATION STANDARDS:

A. **PERSONAL SKILLS -** Students will understand how personal skill development affects their employability. This skill includes positive attitudes, self-confidence, honesty, responsibility, initiative, self-discipline, personal hygiene, time management, and the capacity for lifelong learning.

1. Demonstrate an understanding of classroom policies and procedures.
2. Discuss importance of the following personal skills in the business environment:
   a. positive attitude
   b. self-confidence
   c. honesty
   d. perseverance
   e. self-management/work ethic
   f. pride in product/work
   g. dependability
3. Identify acceptable work attire.
4. Establish goals for self-improvement and further education/training.
5. Prioritize tasks and meet deadlines.
6. Understand the importance of initiative and leadership.
7. Understand the importance of lifelong learning in a world of constantly changing technology.

B. **INTERPERSONAL SKILLS** - Students will understand key concepts on group dynamics, conflict resolution, and negotiation. This skill includes the ability to work cooperatively, accept supervision, assume leadership roles, and show respect for others. This standard includes an understanding of sexual harassment laws and an appreciation of cultural diversity in the workplace.

1. Identify and discuss behaviors of an effective team.
2. Explain the central importance of mutual respect in the workplace relations.
3. Discuss and demonstrate strategies for conflict resolution and negotiation, and explain their importance within the business environment.
4. Understand laws that apply to sexual harassment in the workplace, and identify tactics for handling harassment situations.
5. Work cooperatively, share responsibilities, accept supervision and assume leadership roles.
6. Demonstrate cooperative working relationships and proper etiquette across gender and cultural groups.

C. **THINKING AND PROBLEM-SOLVING SKILLS** - Students will exhibit critical and creative thinking skills, logical reasoning, and problem-solving. These skills include applying basic skills in order to calculate, estimate, measure; identify, locate, and organize information/data; interpret and follow directions from manuals, labels, and other sources; analyze and evaluate information and solutions.

1. Recognize the importance of good academic skills and implement a plan for self-improvement as needed.
2. Read, write, and give directions.
3. Exhibit critical and creative thinking skills and logical reasoning skills, and employ these skills for problem solving.
   a. Work as a team member in solving problems.
   b. Diagnose the problem, its urgency, and its causes.
   c. Identify alternatives and their consequences.
   d. Explore possible solutions.
   e. Compare/contrast the advantages and disadvantages of alternatives.
   f. Determine appropriate action(s).
   g. Implement action(s).

h. Evaluate results of action(s) taken.

D. **COMMUNICATION SKILLS** - Students will understand principles of effective communication. This standard includes effective oral and written communication, listening skills, following and giving directions, requesting and giving information, asking questions.

1. Use communication concepts in application of skills, techniques, and operations.
   a. Prepare written material.
   b. Analyze written material.
2. Understand and implement written instructions, from technical manuals, written communications, and reference books.
3. Present a positive image through verbal and nonverbal communication, and understand the power of body language in communication.
4. Demonstrate active listening through oral and written feedback.
5. Give and receive feedback.
6. Demonstrate assertive communications (both oral and written).
7. Demonstrate proper etiquette in workplace communications, including an awareness of requisites for international communications (languages, customs, time zones, currency and exchange rates).
8. Demonstrate writing/editing skills as follows:
   a. Write, proofread, and edit work.
   b. Use correct grammar, punctuation, capitalization, vocabulary, and spelling.
   c. Select and use appropriate forms of technology for communication.
9. Exhibit a proficiency in the use of reference books.
10. Research, compose, and orally present information for a variety of business situations utilizing appropriate technology.

E. **OCCUPATIONAL SAFETY** - Students will understand occupational safety issues, including the avoidance of physical hazards in the work environment. This includes the safe operation of equipment, proper handling of hazardous materials, appropriate attire and safety accessories, avoidance of physical injuries, interpretation of warning and hazard signs and terminology, and following and understanding safety-related directions.

1. Discuss and implement good safety practices, including the following (if applicable to course):
   a. personal
   b. lab
   c. fire
   d. electrical
   e. equipment
   f. tools
   g. interpretation of Material Safety Data Sheets (MSDSs)
   h. Environmental Protection Agency (EPA)
   i. Occupational Safety and Health Administration (OSHA)
   j. American Red Cross Standards (ARC)
   k. Networking Safety Standards
2. Apply sound ergonomic principles in organizing one’s work space.

F. **EMPLOYMENT LITERACY** - Students will understand career paths and strategies for obtaining employment within their chosen field. This includes traditional job preparation skills, such as resumes, application forms, cover letters, sources of employment information, and interviewing skills, but also includes an overview of the industry and an understanding of labor market trends.

1. Explore career opportunities and projected trends; investigate required education, training and experience; and develop an individual education plan.
2. Identify steps for setting goals and writing personal goals and objectives.

3. Examine aptitudes related to career options; relate personal characteristics and interests to educational and occupational opportunities.
4. Develop a career portfolio, including the following documents:
    a. job application
    b. resume(s)
    c. appropriate cover and follow-up correspondence
5. Identify and demonstrate effective interviewing techniques.

G. **TECHNOLOGY LITERACY** - Students will understand and adapt to changing technology by identifying, learning, and applying new skills to improve job performance. Students should understand the role of technology in their chosen field and should be able to use all appropriate technology. Students should also feel confident in their ability to learn new technology by generalizing from what they know, adapting skills to new situations, and identifying and using sources of information and of further learning.

1. Demonstrate the ability to use personal computers for loading and retrieving data, information gathering, measurements, and writing.
2. Identify the characteristics and explain the importance of adapting to changes, being flexible, and evaluating goals when working in the industry.
3. Understand the importance of lifelong learning in adapting to changing technology.

H. **IMPORTANCE OF ETHICS** – Students will understand proper ethics in the workplace.

1. Discuss social and ethical responsibilities in the industry.
2. Demonstrate ethical choices in workplace situations.