POLYTECHNICS
MINISTRY OF EDUCATION MALAYSIA
DEPARTMENT OF ELECTRICAL ENGINEERING

COURSE : DEE3052 ELECTRONIC EQUIPMENT REPAIR
INSTRUCTIONAL DURATION : 15 WEEKS
CREDIT(S) : 2
PRE REQUISITE(S) : DEE 2013 SEMICONDUCTOR DEVICES

SYNOPSIS

ELECTRONIC EQUIPMENT REPAIR provides the knowledge and skills on troubleshooting and repairing the electronics equipment. This course focuses on the identification of faults in audio amplifier, regulated dc power supply, radio CD player, colour TV receiver and domestic electronic appliances. This course also provides knowledge and skills on troubleshooting and repairing the electronic laboratory equipment.

COURSE LEARNING OUTCOMES (CLO)

Upon completion of this course, students should be able to:-

1. apply the knowledge of hand tools, soldering technique and test equipment in troubleshooting and repairing electronic equipment. (C3, PLO1)

2. solve problems related to electronic equipment repair using the correct diagnosis technique. (C3, PLO2)

3. fix the electronic equipment fault using the correct diagnosis technique. (P4, PLO5)

4. demonstrate an awareness of entrepreneurship in repairing the domestic electronic appliances through essay question within a stipulated time frame. (A3, PLO9)
SUMMARY (LECTURE : PRACTICAL)

SST

1.0 HAND TOOLS AND SOLDERING TECHNIQUE
Safety and laboratory procedure, hand tools that are used in troubleshoot and repair activities. Types of soldering tools and desoldering tools, soldering technique, good and bad soldering, type of bad soldering.

2.0 TESTING EQUIPMENT
Testing equipment: analogue and digital multimeter, oscilloscope, AF/RF signal generator, transistor tester and colour TV test pattern generator.

3.0 DIAGNOGSIS TECHNIQUE
Process of disassemble and assemble electronic equipment during repair activities. Faults analyzing techniques: visual techniques, injection and tracing techniques, voltages and resistances measurement technique. Testing and identifying the terminals of a passive and active component using test equipment and data sheet.

4.0 POWER SUPPLY
Function of power supply block diagram, power supply circuit diagram, fault in power supply circuit and troubleshoot DC power supply unit.

5.0 AUDIO AMPLIFIER
Principle, operation and troubleshoot of simple audio amplifier. Principle and troubleshoot of PA system.

6.0 DOMESTIC ELECTRONICS APPLIANCES
Basic principle of radio and colour tv receiver: block diagram and function of each block, schematic diagram, identify every stage, signal tracing and injecting techniques. DC voltage and resistances measurement at given test point of radio CD player and colour TV receiver and faulty components replacement.

7.0 ELECTRONIC LABORATORY EQUIPMENTS
Basic principle of audio generator and RF generator: block diagram and function of each block, schematic diagram, signal tracing and injecting technique, DC voltages and resistances measurement at given test point and faulty components replacement.

DEPENDENT LEARNING COURSEWORK ASSESSMENT

RTA - Recommended Time Allocation
SST - Suggested Sequence of Topics
SYLLABUS

1.0 HAND TOOLS AND SOLDERING TECHNIQUE

1.1 Know the usage of hand tools
   1.1.1 List safety and laboratory procedure.
   1.1.2 Describe types and the functions of hand tools
       a. Long nose pliers
       b. Side cutter
       c. Tweezers
       d. Wire stripper
       e. Screw drivers

1.2 Know soldering technique and soldering tools.
   1.2.1 State types and functions of soldering tools.
       a. Soldering iron
       b. Soldering gun
   1.2.2 State the importance of heating power of the soldering tools.
   1.2.3 State types and functions of desoldering tools.
       a. Solder sucker
       b. Solder wick

1.3 Understand soldering technique
   1.3.1 Explain soldering technique
       a. Good soldering technique
       b. Good and bad soldering
       c. Type of bad soldering – cool solder, dry joint, bubble etc
   1.3.2 Explain the ratio of Pb/lead in soldering lead compound

1.4 Apply soldering technique using soldering station
   1.4.1 Use soldering and desoldering station according to standard operating procedure (SOP).

2.0 TEST EQUIPMENT

2.1 Understand test equipment and its operation
   2.1.1 Explain the function of test equipment
       a. Analogue and Digital Multimeter
       b. Oscilloscope
       c. Audio and RF Signal Generator
       d. Transistor Tester
       e. Colour TV test pattern generator

2.2 Apply the knowledge of test equipment operation in operating the equipment
   2.2.1 Demonstrate how to operate test equipment according to standard operating procedure (SOP)
       a. Analogue and Digital Multimeter
       b. Oscilloscope
       c. Audio and RF Signal Generator
d. Transistor Tester  
e. Colour TV test pattern generator

3.0 DIAGNOSIS TECHNIQUES

3.1 Understand the process of disassemble and assemble of electronic equipment

3.1.1 Explain how to disassemble the casing/housing of the equipment to be repaired using proper hand tools

3.1.2 Explain how to assemble the casing/housing of the equipment after repair using proper hand tools

3.2 Understand the diagnosis technique to diagnose fault in electronic equipment

3.2.1 Explain the visual technique to diagnose fault in electronic equipment  
   a. Burning effect  
   b. Shorting effect  
   c. Broken effect  
   d. Heat effect

3.2.2 Explain the injection technique to diagnose fault in electronic equipment  
   a. Using Audio/Function Generator  
   b. Using RF Signal Generator

3.2.3 Explain the signal tracing technique to diagnose fault in electronic equipment using an oscilloscope

3.2.4 Explain the voltage measurement technique to diagnose fault in electronic equipment  
   a. Normal voltage of given circuit  
   b. Abnormal voltage due to faulty component in the given circuit.

3.2.5 Explain the resistance measurement technique to diagnose fault in electronic equipment using multimeter  
   a. Check for open, short and leakage  
   b. Measure resistance of faulty components

3.3 Apply diagnosis technique to identify fault in passive and active components

3.3.1 Use multimeter to measure the resistance of a passive and active component  
   a. Resistance of resistors  
   b. Charging and discharging effect of the capacitors  
   c. Continuity of Inductors, Transformers, Relays and Speakers.  
   d. Continuity of Fuses  
   e. Continuity of Switches  
   f. Forward and reverse resistance of the Diode and zener diode  
   g. Terminal of bipolar transistor  
   h. Terminal of SCR

3.3.2 Use datasheet to identify the terminal of active components  
   a. Terminal of diodes, bipolar transistor, SCR, UJT, FET, Diac and Triac  
   b. IC pin configuration  
   c. Components rating value
4.0 POWER SUPPLY
4.1 Understand the power supply block diagram
   4.1.1 Explain types of power supply
      a. Linear DC regulator power supply
      b. Switching mode power supply
   4.1.2 Explain the operation of linear DC regulator power supply
      a. using transistor
      b. using IC (uA 723 and 78XX/79XX IC regulator family)
   4.1.3 Explain the operation of switching mode power supply
4.2 Understand types of fault in power supply circuit
   4.2.1 Explain types of fault in transistorize Linear DC Regulator power supply.
   4.2.2 Explain types of fault in IC Linear DC Regulator power supply (uA 723 and 78XX / 79XX IC regulator family)
   4.2.3 Explain types of fault in switching mode power supply
4.3 Apply diagnosis technique to troubleshoot DC power supply unit
   4.3.1 Apply diagnosis technique to troubleshoot transistorize Linear DC Regulator power supply.
   4.3.2 Apply diagnosis technique to troubleshoot IC Linear DC Regulator power supply (uA 723 and 78XX / 79XX IC regulator family).
   4.3.3 Apply diagnosis technique to troubleshoot Switching mode power supply.

5.0 AUDIO AMPLIFIER
5.1 Know a simple Audio Amplifier
   5.1.1 Sketch an Audio Amplifier block diagram
   5.1.2 Identify every stage in simple Audio Amplifier
   5.1.3 Identify specific components in simple Audio Amplifier
5.2 Understand the principle of simple Audio Amplifier
   5.2.1 Explain the principle of Audio Amplifier
   5.2.2 Explain the function of each block of an Audio Amplifier block diagram
   5.2.3 Interpret schematic diagram of simple Audio Amplifier
5.3 Apply the measurement tools to test the functionality of Audio Amplifier
   5.3.1 Use audio generator and oscilloscope to measure the voltage gain of the amplifier
   5.3.2 Use multimeter to measure DC voltage
5.4 Apply diagnosis technique to troubleshoot fault in Audio Amplifier
   5.4.1 Apply diagnosis technique to troubleshoot fault in simple Audio Amplifier
      a. Supply line
      b. Coupling component/signal line
      c. Biasing
      d. Filtering
      e. Distorted output
5.4.2 Apply soldering and desoldering technique to replace faulty components

5.5 Understand the principle of PA system
5.5.1 Interpret schematic diagram of PA system
5.5.2 Explain every stage in PA system
   a. Preamplifier
   b. Equalizer/tone control
   c. Driver
   d. Power Amplifier

5.6 Apply diagnosis technique to troubleshoot fault in PA system unit
5.6.1 Apply diagnosis technique to troubleshoot fault in PA system unit
   a. Supply line
   b. Coupling component/signal line
   c. Biasing
   d. Filtering
   e. Distorted output

5.6.2 Apply soldering and desoldering technique to replace faulty components

6.0 DOMESTIC ELECTRONIC APPLIANCES

6.1 Know radio CD player
   6.1.1 Draw AM and FM radio block diagram
   6.1.2 Identify every stage in radio CD player
   6.1.3 Identify the specific components in the radio CD player

6.2 Understand the basic principle of radio CD player
   6.2.1 Explain the basic principle of AM and FM radio receiver and CD player
   6.2.2 Explain the function of each block in AM and FM radio block diagram
   6.2.3 Interpret schematic diagram of a radio CD player

6.3 Apply the measurement tools to test the functionality of radio CD player
   6.3.1 Use tracing and injecting signal technique to test the functionality of radio CD player
   6.3.2 Use multimeter to measure the DC voltage at specific test point

6.4 Apply diagnosis technique to troubleshoot fault in radio CD player
   6.4.1 Apply diagnosis technique to troubleshoot fault in radio CD player
      a. Power supply section
      b. Audio section
      c. IF section
      d. Tuner section
      e. CD section

   6.4.2 Apply soldering and desoldering technique to replace faulty components
6.5 Know colour TV receiver
   6.5.1 Draw a colour TV block diagram
   6.5.2 Identify every stage in colour TV receiver
   6.5.3 Identify the specific components in colour TV receiver

6.6 Understand the basic principle of colour TV receiver
   6.6.1 Explain the basic principle of colour TV receiver
   6.6.2 Explain the function of each block in colour TV block diagram
   6.6.3 Interpret the schematic diagram of colour TV receiver

6.7 Apply the measurement tools to test the functionality of colour TV receiver
   6.7.1 Use tracing signal technique to test the functionality of a colour TV receiver
   6.7.2 Use multimeter to measure DC voltage at specific test point in colour TV receiver

6.8 Apply diagnosis technique to troubleshoot fault in colour TV receiver
   6.8.1 Apply diagnosis technique to troubleshoot fault in colour TV receiver
      a. Power supply section
      b. VIF section
      c. RGB section
      d. Colour section
      e. Deflection section
   6.8.2 Apply soldering and desoldering technique to replace faulty components

6.9 Apply entrepreneurial skill in repairing the domestic electronic appliances environment
   6.9.1 Calculate the costing of component replacement and labour in domestic electronic appliances repair

7.0 ELECTRONIC LABORATORY EQUIPMENT

7.1 Know audio generator
   7.1.1 Draw a block diagram of audio generator
   7.1.2 Identify every stage in audio generator
   7.1.3 Identify specific components in audio generator unit

7.2 Understand the basic principle of audio generator
   7.2.1 Explain basic principle of an audio generator
   7.2.2 Explain the function of each block in audio generator block diagram
   7.2.3 Interpret schematic diagram of audio generator

7.3 Apply the measurement tools to test the functionality of audio generator
   7.3.1 Use tracing and injecting signal technique to test the functionality of audio generator
   7.3.2 Use multimeter to measure DC voltage at related test points in audio generator
7.4 Apply diagnosis technique to troubleshoot fault in audio generator
7.4.1 Apply diagnosis technique to troubleshoot fault in audio generator
   a. Power supply section
   b. Oscillator section
   c. Attenuator/Amplifier section
7.4.2 Apply soldering and desoldering technique to replace faulty components

7.5 Know RF signal generator
7.5.1 Draw a block diagram of RF signal generator
7.5.2 Identify every stage in RF signal generator
7.5.3 Identify specific components in RF signal generator

7.6 Understand the basic principle of RF signal generator
7.6.1 Explain basic principles of RF signal generator
7.6.2 Explain the function of each block in RF signal generator block diagram
7.6.3 Interpret schematic diagram of RF signal generator

7.7 Apply the measurement tools to test the functionality of RF signal generator
7.7.1 Use tracing and injecting signal technique to test the functionality of RF signal generator
7.7.2 Use multimeter to measure DC voltage at related test points in RF signal generator

7.8 Apply diagnosis technique to troubleshoot fault in RF signal generator
7.8.1 Apply diagnosis technique to troubleshoot fault in RF signal generator
   a. Power supply section
   b. Oscillator section
   c. Attenuator/Amplifier section
7.8.2 Apply soldering and desoldering technique to replace faulty components
REFERENCES

Main


Additional:


# MATRIX OF COURSE LEARNING OUTCOMES (CLO) VS PROGRAMME LEARNING OUTCOMES (PLO)

<table>
<thead>
<tr>
<th>Course Learning Outcome (CLO)</th>
<th>Compliance to PLO</th>
<th>Recommended Delivery Methods</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Apply the knowledge of hand tools, soldering technique and test equipment in troubleshooting and repairing electronic equipment.</td>
<td>√</td>
<td>Lecture</td>
<td>Quiz Theory Test</td>
</tr>
<tr>
<td></td>
<td>C3</td>
<td>Demonstrate Discussion</td>
<td>Essay Question</td>
</tr>
<tr>
<td>2. Solve problems related to electronic equipment repair using the correct diagnosis technique.</td>
<td>√</td>
<td>Quiz</td>
<td>End of Chapter Theory Test</td>
</tr>
<tr>
<td></td>
<td>C3</td>
<td>Practical Activity</td>
<td>Practical Work Practical Test</td>
</tr>
<tr>
<td>3. Fix the electronic equipment fault using the correct diagnosis technique.</td>
<td>√</td>
<td>Practical Activity</td>
<td>Practical Work Practical Test</td>
</tr>
<tr>
<td>4. Demonstrate an awareness of entrepreneurship in repairing the domestic electronic appliances through essay question within a stipulated time frame.</td>
<td>√</td>
<td>Lecture</td>
<td>Essay Question</td>
</tr>
</tbody>
</table>

**Remark:**
- LD1 Knowledge
- LD 2 Practical Skills
- LD 3 Communication Skills
- LD 4 Critical Thinking and Problem Solving Skills
- LD 5 Social Skills and Responsibilities
- LD 6 Continuous Learning and Information Management Skills
- LD 7 Management and Entrepreneurial Skills
- LD 8 Professionalism, Ethics and Moral
- LD 9 Leadership and Teamwork Skills
ASSESSMENT

The course assessment comprises two components, namely:

i. **Coursework Assessment (CA) - 100%**
   Coursework assessments that measure knowledge, practical skills and generic skills are carried out in the form of continuous assessment. Coursework assessments total score comprises the knowledge and practical marks ONLY. It does not include the mark of generic skills.

ii. **Final Examination (FE) - NONE**
   Final examination is carried out at the end of the semester.

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**ASSESSMENT SPECIFICATION TABLE (AST)**

<table>
<thead>
<tr>
<th>COURSE LEARNING OUTCOMES (CLO)</th>
<th>TOPICS</th>
<th>ASSESSMENT TASKS FOR COURSEWORK (CA)</th>
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<tbody>
<tr>
<td></td>
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<td>Quiz</td>
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<tr>
<td>1. Apply the knowledge of hand tools, soldering technique and test equipment in troubleshooting and repairing electronic equipment.</td>
<td></td>
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<tr>
<td>2. Solve problems related to electronic equipment repair using the correct diagnosis technique.</td>
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<tr>
<td>COURSE LEARNING OUTCOMES (CLO)</td>
<td>TOPICS</td>
<td>ASSESSMENT TASKS FOR COURSEWORK (CA)</td>
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</table>
| 3. Fix the electronic equipment fault using the correct diagnosis technique. | ● ● ● ● ● ● | Quiz: *(4) 10%  
Theory Test: *(1) 20%  
Practical Work: *(6) 50%  
Practical Test: *(1) 10%  
End of Chapter: *(1) 5%  
Essay Question: *(1) 5% |
| 4. Demonstrate an awareness of entrepreneurship in repairing the domestic electronic appliances through essay question within a stipulated timeframe. | ● ● | |

**Remark**

- **Topic 1**: Hand Tools and Soldering Technique
- **Topic 2**: Testing Equipment
- **Topic 3**: Diagnosis Technique
- **Topic 4**: Power Supply
- **Topic 5**: Audio Amplifier
- **Topic 6**: Domestic Electronics Appliances
- **Topic 7**: Electronic Laboratory Equipments

- √ Refers to the CLO to be assessed through the indicated assessment task.
- *(#)* # refers to the quantity of assessment.
- ● Indicates the topic(s) to be covered under the assigned/identified assessment tasks. For merged topics, lecturers have the options of choosing the preferred topic(s).
- ** The generic skills are to be assessed separately. The total score for generic skills is 100%. However, it is NOT PART of the coursework assessment mark.
### DEPENDENT LEARNING

<table>
<thead>
<tr>
<th>No.</th>
<th>Learning and Teaching Activity</th>
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<td>1.2</td>
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<td>1.3</td>
<td>Tutorial</td>
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#### 2.0 Coursework Assessment (CA)

<table>
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<tr>
<th>2.1</th>
<th>Lecture-hour-assessment</th>
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<td>Theory Test [1]</td>
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<td>Tutorial Exercise</td>
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### INDEPENDENT LEARNING

#### 3.0 Coursework Assessment (CA)

<table>
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<th>3.0</th>
<th>Coursework Assessment (CA)</th>
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<tbody>
<tr>
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<td>End of Chapter [1]</td>
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<td>Essay Question [1]</td>
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#### 4.0 Preparation and Review

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<td>Preparation before theory class eg: download lesson notes</td>
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<tr>
<td></td>
<td>Review after theory class eg: additional references, discussion group, discussion</td>
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<th>4.2</th>
<th>Practical</th>
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<td>Preparation before practical class/field work/survey eg: review notes, check list/labsheets</td>
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<tr>
<td></td>
<td>Post practical activity eg: lab report, additional, references, discussion session</td>
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<td>Preparation before studio work presentation/critique.</td>
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<th>4.4</th>
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<td>Preparation for practical test [1]</td>
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**Total 80**

Credit = SLT/40 2

### Remark:

1. **Suggested time for**
   - Quiz : 10 - 15 minutes
   - Test (Theory) : 30 - 60 minutes
   - Test (Practical) : 45 - 60 minutes

2. 40 hours is equivalent to 1 credit