

1 Module Details	
Module Name	Consumer Audio Electronics
Nominal duration	It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 36 to 40 hours.
Module code	NUE160
Discipline code	0703230
2 Module purpose	This module will provide students with the knowledge and skills to install, repair, adjust and test consumer audio equipment.
3 Prerequisites	Amplifier Applications (NE08) Sound and Acoustics (NE91)
4 Relationship to competency standards	This module provides some of the knowledge and skills underpinning competency in the following standards: National Electrotechnology Industry Standards, Units: NES106, NES206, NES301, NES402, NES501; Metals and Engineering Industry Standards, Units 12.2A, 18.56A, 18.57A, 18.65A
5 Content	<ol style="list-style-type: none">1. Analysis of audio amplifier circuits including<ul style="list-style-type: none">- pre amplifiers- RIAA equalisation- passive and active tone control circuits- loudness circuits- power amplifiers Integrated and discrete- DC stabilisation circuits- output current overload protection circuits- output DC protection circuits- negative feedback2. Adjustment of power output stage bias3. Definition and testing of the following<ul style="list-style-type: none">- output power- damping factor- signal to noise ratio- stereo separation- distortion harmonic and intermodulation- frequency response and phase distortion- slew rate- transient response- tone control response- loudness control response4. Location of faults in audio amplifiers<ul style="list-style-type: none">- replacement of components- component data- circuit analysis and component location5. Interpretation of specification for the following system

	<ul style="list-style-type: none"> components to enable correct interconnections - audio amplifiers - cassette decks - CD players - graphic equalisers - loudspeakers - turntables
	<ul style="list-style-type: none"> 6. System controllers <ul style="list-style-type: none"> - principles - remote controls - system fault finding
6 Assessment strategy	
Assessment methods	Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving.
Conditions of assessment	Learning and assessment will take place in a classroom/laboratory environment.
7 Learning Outcome Details	
Learning Outcome 1	Demonstrate the ability to interpret circuit diagrams of audio amplifiers.
Assessment criteria	<ul style="list-style-type: none"> 1.1 Given a circuit diagram of an audio amplifier draw a block diagram of the circuit showing each stage and identify its function. 1.2 Given the circuit diagram of an audio stereo amplifier identify circuitry associated with the following functions: <ul style="list-style-type: none"> - volume control - tone control - loudness circuit - input selector - RIAA equalisation pre amplifier - components in the AC signal path - components which supply DC power - components which effect DC stability - components that provide amplifier or speaker protection - components that provide AC feedback 1.3 Given the circuit diagram of an audio amplifier identify: <ul style="list-style-type: none"> - the arrangement of the power output stage and describe how it operates - the frequency compensation devices which prevent high frequency oscillations or instability
Learning Outcome 2	Demonstrate the ability to correctly adjust and test the power output stage of an amplifier.
Assessment criteria	<ul style="list-style-type: none"> 2.1 Given an amplifier, test equipment and relevant service information demonstrate the ability to adjust and test the

	no signal (quiescent) current in the power output stage. State the factors that determine the no signal current.
Learning Outcome 3	Define and measure the specifications associated with voltage and power amplifiers.
Assessment criteria	<p>3.1 Define and measure the following voltage amplifier specifications:</p> <ul style="list-style-type: none"> - signal to noise ratio - stereo separation - input overload and sensitivity - tone and loudness control responses <p>3.2 Define and measure the following power amplifier specifications:</p> <ul style="list-style-type: none"> - output power - damping factor - distortion (both harmonic and intermodulation) - frequency and phase response - slew rate - transient response (rise time)
Learning Outcome 4	Fault-find voltage and power amplifiers to the component level.
Assessment criteria	<p>4.1 Given a faulty power or voltage amplifier, its circuit diagram and appropriate test equipment locate the faulty components by observation of the output, visual inspection, and by interpretation of the relevant measurements.</p> <p>4.2 Select suitable replacement components using manufacturers' data.</p> <p>4.3 Replace defective components in a faulty amplifier.</p> <p>4.4 Test the repaired amplifier for correct operation.</p>
Learning Outcome 5	Interpret audio equipment specifications and correctly connect this equipment in an audio system.
Assessment criteria	5.1 Given a range of audio equipment including amplifier, tuners, tape decks, CD players, turntables, graphic equalisers, loudspeakers connect this equipment together for optimum performance-using manufacturers' data. Identify any non-compatible levels or impedances in this arrangement.
Learning Outcome 6	Explain the operation of the system control circuits including remote control.
Assessment criteria	<p>6.1 Sketch the block diagram of the system control section of an audio system and explain the purpose of each block.</p> <p>6.2 Sketch the block diagram of an infra-red remote control transmitter/receiver and explain the operation of each block.</p> <p>6.3 List the most common functions provided on a remote control.</p> <p>6.4 Test a remote control transmitter for correct output levels using an oscilloscope.</p> <p>6.5 Test a remote control receiver for correct operation according to manufacturers' data.</p>

8 Delivery of module**Delivery strategy**

Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective method to achieve this is by integration of theory and practice where students learn by experimentation, research and reports. It is recommended that learning and assessment be facilitated in a holistic manner that may require learning outcome sequence other than that indicated in the module.

Resource requirements

Resources should be sufficient for students to carry out learning activities on an individual basis. This will require the following:

Cathode ray oscilloscopes, dual trace
 Low distortion sine and square wave oscillators
 Power amplifiers
 Analog and digital meters
 Microammeters
 LCR meters
 Compact disc players with service manuals
 Selection of test discs
 Selection of music CDs
 Laser power meters
 Samples of optical pick-up assemblies
 HiFi cassette deck with service manuals
 Selection of test cassettes
 Selection of music cassettes
 Digital audio tape recorders with service manuals
 Selection of test tapes
 Selection of music tapes
 AM/FM stereo tuners with service manuals
 Turntable and tone arm units
 Microphones, cardioid
 Microphones, omnidirectional
 HiFi amplifiers
 HiFi graphic equalisers
 General purpose speakers
 Noise and distortion meters
 HiFi loudspeakers
 Sound level meters
 Stylus microscopes
 Wow and flutter meters
 Stereo multiplex signal generators
 Basic studio/stage mixers
 Audio real time spectrum analysers
 Keyboard musical instrument synthesisers
 Headphones
 AM tuners with service manual
 FM tuners with service manual

Useful references include:

Evans, Alvis J. "The Electronics of Sound" Master Publishing Inc., 1990.

Tremaine, Howard M. "Audio Encyclopedia" Howard Sams.

**Occupational Health and
Safety Requirements**

Indianapolis, 1994.

Sinclair, Ian R. "Audio Electronics Reference Book"
Blackwell Science Inc., 1989
ISBN 0632019298

Hood, John Linsley, Hood, Linsley Audio Electronics
2nd edition, Butterworth-Heinemann, May 1999
ISBN 0750643323

A safe and healthy environment will be provided for students and teachers as well as the particular safety procedures followed as part of the learning / teaching content.