



**AVIT**  
AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY



VINAYAKA MISSION'S  
RESEARCH FOUNDATION  
(Deemed to be University under section 3 of the UGC Act 1956)



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## DEPARTMENT OF BIOMEDICAL ENGINEERING

### MEDICAL INSTRUMENTATION LAB

### STANDARD OPERATING PROCEDURE

Name of the Lab	Medical Instrumentation Lab
Purpose	To obtain the ECG Waveform of the Subject and view the same using DSO and understand the working methodology of various modules.
Scope	Acquisition of Electro Cardio Gram.
Responsibility	Faculty In Charge of the Lab – Monitoring if the students are following the SOP & recommending revisions wherever needed

#### STANDARD OPERATING PROCEDURE FOR ECG TRAINER KIT

This section should describe how to use the device ECG Trainer Kit

- Connect the instrument to the mains.
- Instrument ON by mains Switch, the switch will be lighted.
- Connect the DSO to the instrument.
- Connect the electrodes to system and Select the required Lead by selector switch.
- Now clean the skin where the electrode connects & apply small amount of conductive gel on electrodes and connect the electrodes to human body or ECG simulator.
- Now vary the Gain knob of amplifier or Voltage / Div knob of DSO as per requirement, also vary Time / Div as per requirement.
- Now change position of lead selector switch & see the output or on the test point.
- If any noise is found on DSO, check the Ground. If Ground or electrodes are not proper the signal gets distorted.

#### PRECAUTIONS TO BE FOLLOWED

- The handling of patient electrodes and the controls of this instrument must always be entrusted only to qualified biomedical person.
- ECG amplifier is a very sensitive electronic instrument. The quality signals are easily affected by the use of unclean badly connected or improperly placed electrodes. Electrodes must also be cleaned out with water and soap after each use.
- The instrument should be protected from damage due to accidental spray from liquids. If liquid spilled over the instrument, they will short circuit or damage components and other surfaces.

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**DEPARTMENT OF BIOMEDICAL ENGINEERING**

**MEDICAL INSTRUMENTATION LAB**

**STANDARD OPERATING PROCEDURE**

Name of the Lab	Medical Instrumentation Lab
Purpose	To obtain the EEG Waveform of the Subject and view the same using DSO and understand the working methodology of various modules.
Scope	Acquisition of Electro Encephalo Gram.
Responsibility	Faculty In Charge of the Lab – Monitoring if the students are following the SOP & recommending revisions wherever needed.

**STANDARD OPERATING PROCEDURE FOR EEG ELECTRODE**

- Connect the instrument to the mains.
- Instrument ON by mains Switch, the switch will be lighted.
- Connect the DSO to the instrument.
- Connect the electrodes to system and Select the required Lead by selector switch.
- Connect the electrodes to system, Put Mode switch at Left position & Left channel selector Switch at No 1 position.
- Clean the skin where the electrode place & apply small amount of conductive gel or use disposable electrodes.
- Now connect the electrodes and acquire the signal on the DSO and make eyes activity up or down, left or right.
- Now vary the Gain knob of amplifier or Voltage / Div knob of DSO as per requirement, also vary Time / Div as per requirement.
- If any noise is found on DSO, check the Ground. If Ground or electrodes are not proper the signal gets distorted.

**PRECAUTIONS:**

- The handling of patient electrodes and the controls of this instrument must always be entrusted only to qualified biomedical person.
- EEG amplifier is a very sensitive electronic instrument. The quality signals are easily affected by the use of unclean badly connected or improperly placed electrodes. Electrodes must also be cleaned out with water and soap after each use.
- The instrument should be protected from damage due to accidental spray from liquids. Protect instrument from fluids and if spilled over the instrument, they will short circuit or damage components and other surfaces.
- Do not use damaged power cord, Electrodes, connector & other peripherals.

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## DEPARTMENT OF BIOMEDICAL ENGINEERING

### MEDICAL INSTRUMENTATION LAB

### STANDARD OPERATING PROCEDURE

Name of the Lab	Medical Instrumentation Lab
Purpose	To obtain the EMG Waveform of the Subject and view the same using DSO and understand the working methodology of various modules.
Scope	Acquisition of Electro MyoGram.
Responsibility	Faculty In Charge of the Lab – Monitoring if the students are following the SOP & recommending revisions wherever needed

#### STANDARD OPERATING PROCEDURE FOR EMG TRAINER KIT

- Connect the instrument to the mains.
- Instrument ON by mains Switch, the switch will be lighted.
- Connect the DSO to the instrument.
- Connect the electrodes to system.
- Clean the skin where the electrode place & apply small amount of conductive gel or use disposable electrodes.
- Now connect the electrodes and acquire the signal on the DSO and make some muscle activity voluntarily or by external stimulations.
- Now vary the Gain knob of amplifier or Voltage / Div knob of DSO as per requirement, also vary Time / Div as per requirement.
- If any noise is found on DSO, check the Ground. If Ground or electrodes are not proper the signal gets distorted.

#### PRECAUTIONS:

- The handling of patient electrodes and the controls of this instrument must always be entrusted only to qualified biomedical person.
- EMG amplifier is a very sensitive electronic instrument. The quality signals are easily affected by the use of unclean badly connected or improperly placed electrodes. Electrodes must also be cleaned out with water and soap after each use.
- The instrument should be protected from damage due to accidental spray from liquids. If liquid spilled over the instrument, they will short circuit or damage components and other surfaces.

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## DEPARTMENT OF BIOMEDICAL ENGINEERING

### MEDICAL INSTRUMENTATION LAB

### STANDARD OPERATING PROCEDURE

Name of the Lab	Medical Instrumentation Lab
Purpose	To obtain the Electrical changes in the Resistance of Skin (Galvanic Skin Response)
Scope	Acquisition of GSR.
Responsibility	Faculty In Charge of the Lab – Monitoring if the students are following the SOP & recommending revisions wherever needed
<b>STANDARD OPERATING PROCEDURE FOR GSR TRAINER KIT</b>	
<ul style="list-style-type: none"> <li>➤ Connect the instrument to the mains.</li> <li>➤ Instrument ON by mains Switch, the switch will be lighted.</li> <li>➤ Connect the DSO to the instrument.</li> <li>➤ Connect the electrodes to system.</li> <li>➤ Clean the skin where the electrode place &amp; apply small amount of conductive gel or use disposable electrodes.</li> <li>➤ Now connect the electrodes and acquire the signal on the DSO.</li> <li>➤ Make some movements and identify the fluctuations in the Skin Resistance. Note that the gain should not be adjusted during these stages.</li> <li>➤ If any noise is found on DSO, check the Ground. If Ground or electrodes are not proper the signal gets distorted.</li> </ul>	
<b>PRECAUTIONS:</b>	
<ul style="list-style-type: none"> <li>➤ The handling of patient electrodes and the controls of this instrument must always be entrusted only to qualified biomedical person.</li> <li>➤ Medical amplifier is a very sensitive electronic instrument. The quality signals are easily affected by the use of unclean badly connected or improperly placed electrodes. Electrodes must also be cleaned out with water and soap after each use.</li> <li>➤ The instrument should be protected from damage due to accidental spray from liquids. If liquid spilled over the instrument, they will short circuit or damage components and other surfaces.</li> </ul>	

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**DEPARTMENT OF BIOMEDICAL ENGINEERING**

**MEDICAL INSTRUMENTATION LAB  
STANDARD OPERATING PROCEDURE**

Name of the Lab	Medical Instrumentation Lab
Purpose	To acquire the vital signs like ECG, SpO2, NIBP and temperature of the subject and evaluate its variation based on several conditions of the subject.
Scope	Acquire and Analyse the vital signs like ECG, SpO2, NIBP and temperature of the subject
Responsibility	Faculty In Charge of the Lab – Monitoring if the students are following the SOP & recommending revisions wherever needed

**STANDARD OPERATING PROCEDURE FOR PATIENT MONITORING SYSTEM**

- Connect various probes and sensors to the device.
- Switch ON the instrument and wait for the instrument to get ready after completing the self test.
- Now clean the skin where the electrode connects & apply small amount of conductive gel (if required) on electrodes and connect the electrodes to human body.
- Acquire the signals in the instrument and analyse the trends of the same.
- Repeat the above procedures for different patient conditions and observe the variations and the source of variations.

**PRECAUTIONS:**

- The handling of patient electrodes and the controls of this instrument must always be entrusted only to qualified biomedical person.
- Patient Monitor is a very sensitive electronic instrument. The quality signals are easily affected by the use of unclean badly connected or improperly placed electrodes. Electrodes must also be cleaned out after each use.
- The instrument should be protected from damage due to accidental spray from liquids. Protect instrument from fluids and if spilled over the instrument, they will short circuit or damage components and other surfaces.

Do not use damaged power cord, Electrodes, connector & other peripherals.

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## DEPARTMENT OF BIOMEDICAL ENGINEERING

### MEDICAL INSTRUMENTATION LAB

### STANDARD OPERATING PROCEDURE

Name of the Lab	Medical Instrumentation Lab
Name of the Equipment	Digital pH Meter
Purpose	To Measure the pH Value and temperature of any sample solution.
Scope	Measure the pH value and Temperature
Responsibility	Faculty In Charge of the Lab – Monitoring if the students are following the SOP & recommending revisions wherever needed

#### STANDARD OPERATING PROCEDURE DIGITAL pH METER

- Connect various probes and sensors to the device.
- Switch ON the instrument and wait for the instrument to get ready after completing the self test.
- Now clean the electrode and place in the solution whose pH and temperature is to be measured.
- Wait for the value to stabilise.
- Repeat the procedure for different solutions.
- Calibrate the equipment whenever necessary.

#### PRECAUTIONS:

- The handling of patient electrodes and the controls of this instrument must always be entrusted only to qualified biomedical person.
- The quality signals are easily affected by the use of unclean badly connected or improperly placed electrodes. Electrodes must also be cleaned out after each use.
- The instrument should be protected from damage due to accidental spray from liquids. Protect instrument from fluids and if spilled over the instrument, they will short circuit or damage components and other surfaces.
- Do not use damaged power cord, Electrodes, connector & other peripherals.
- Do not stir the solution using the pH Electrode.

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**DEPARTMENT OF BIOMEDICAL ENGINEERING**

**MEDICAL INSTRUMENTATION LAB**

**STANDARD OPERATING PROCEDURE**

Name of the Lab	Medical Instrumentation Lab
Name of the Equipment	Design of biological Preamplifier
Purpose	To educate the students in using the PreAmplifier
Scope	To enable the students to gather basic knowledge on the various types of amplifiers and the Usage of Preamplifiers in Biomedical equipment.
Responsibility	Faculty In Charge of the Lab – Monitoring if the students are following the SOP & recommending revisions wherever needed
<b>STANDARD OPERATING PROCEDURE INSTRUMENTATIONAL AMPLIFIER</b>	
<ul style="list-style-type: none"> <li>➤ The connections should be given in the trainer kit as per the experiment.</li> <li>➤ The connections are to be verified by the instructor before switching on the trainer kit.</li> <li>➤ The input signal and the carrier signal are given and the modulated output is observed.</li> <li>➤ After completing the experiment, the trainer kit is switched off and the connections are removed.</li> </ul>	
<b>PRECAUTIONS:</b>	
<ul style="list-style-type: none"> <li>➤ The trainer kit is switched on only after checking the connections.</li> <li>➤ After completing the experiment, the trainer kit is switched off and the connections are disconnected.</li> </ul>	

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**DEPARTMENT OF BIOMEDICAL ENGINEERING**

**MEDICAL INSTRUMENTATION LAB  
STANDARD OPERATING PROCEDURE**

Name of the Lab	Medical Instrumentation Lab
Name of the Equipment	Study of Optical Isolation Amplifier
Purpose	To study the Characteristics of Optical Isolation Amplifier
Scope	To enable the students to gather basic knowledge on Optical Isolation Amplifier
Responsibility	Faculty In Charge of the Lab – Monitoring if the students are following the SOP & recommending revisions wherever needed
<b>STANDARD OPERATING PROCEDURE OF OPTICAL ISOLATION AMPLIFIER</b>	
<ul style="list-style-type: none"> <li>➤ The connections should be given in the trainer kit as per the experiment.</li> <li>➤ The connections are to be verified by the instructor before switching on the trainer kit.</li> <li>➤ The input signal and the carrier signal are given and the modulated output is observed.</li> <li>➤ After completing the experiment, the trainer kit is switched off and the connections are removed.</li> </ul>	
<b>PRECAUTIONS:</b>	
<ul style="list-style-type: none"> <li>➤ The trainer kit is switched on only after checking the connections.</li> <li>➤ After completing the experiment, the trainer kit is switched off and the connections are disconnected.</li> </ul>	

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## DEPARTMENT OF BIOMEDICAL ENGINEERING

### MEDICAL INSTRUMENTATION LAB

### STANDARD OPERATING PROCEDURE

Name of the Lab	Medical Instrumentation Lab
Purpose	To describe the hearing of a person for the various frequencies and evaluate the rate of hearing loss (if any).
Scope	Analyse the Audibility and level of hearing loss.
Responsibility	Faculty In Charge of the Lab – Monitoring if the students are following the SOP & recommending revisions wherever needed

#### STANDARD OPERATING PROCEDURE FOR CLINICAL AUDIOMETER

- Connect the instrument to the mains.
- Put all knobs at zero position. Switch ON the kit.
- Connect head phone at Head Phone socket at Right & Left socket and patient response switch at patient Switch Socket.
- Head Phone connects to patient & Patient switch in patient Hand.
- Put the Selector Switch on Right Position. Frequency switches on 250Hz, dB on -10dB Press Interrupter, if no response from patient than increases the dB level still response from patient. Mark in the Audiogram 'o'. Now put dB switch on -10 & frequency 500Hz. Adjust dB.
- Perform the above step till 8000Hz.
- Repeat the procedure for Left Year.
- Put selector switch on Right & Left position & plot the graph.

#### PRECAUTIONS:

- The handling of the controls of this instrument must always be entrusted only to qualified biomedical person.
- Clinical Audiometer is a very sensitive electronic instrument. Accessories must also be cleaned out after each use.  
The instrument should be protected from damage due to accidental spray from liquids. If liquid spilled over the instrument, they will short circuit or damage components and other surfaces.

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## DEPARTMENT OF BIOMEDICAL ENGINEERING

### MEDICAL INSTRUMENTATION LAB

### STANDARD OPERATING PROCEDURE

Name of the Lab	Medical Instrumentation Lab
Purpose	To understand the working principle of FM Modulation, Transmission, Receiving and Demodulation of Bio signal in a modular way.
Scope	Transmit and Receive a Bio Signal using Frequency Modulation.
Responsibility	Faculty In Charge of the Lab – Monitoring if the students are following the SOP & recommending revisions wherever needed

#### STANDARD OPERATING PROCEDURE FOR BIO TELEMETRY KIT

- Connect various modules of the equipment as instructed.
- Switch ON the battery power supply. The current monitor terminals in the front panel of the battery unit should be shorted using the jumper wire.
- Connect the DSO to the instrument.
- Connect the electrodes to system.
- Now clean the skin where the electrode connects & apply small amount of conductive gel on electrodes and connect the electrodes to human body or ECG simulator.
- Now vary the Gain knob of amplifier or Voltage / Div knob of DSO as per requirement, also vary Time / Div as per requirement.
- The transmitted ECG/Pulse signal can be received by FM receiver module on the receiver side, the received ECG/Pulse signal can be viewed from the output of FM Demodulator.

#### PRECAUTIONS:

- The handling of the controls of this instrument must always be entrusted only to qualified biomedical person.
- Biotelemetry Kit is a very sensitive electronic instrument. Accessories must also be cleaned out after each use.  
The instrument should be protected from damage due to accidental spray from liquids. If liquid spilled over the instrument, they will short circuit or damage components and other surfaces.

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