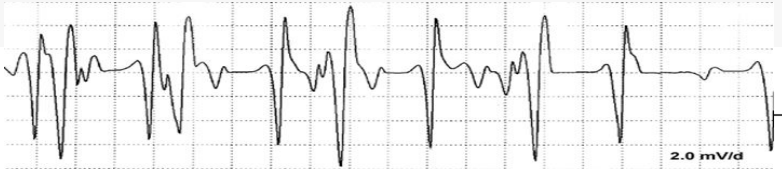
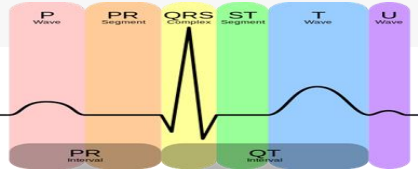
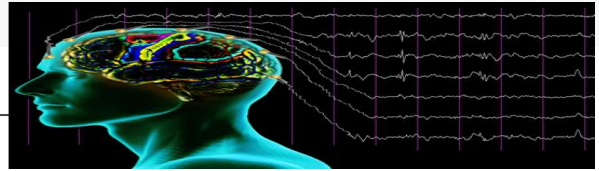
Development of A Multichannel Modular Universal Biopotential Amplifier Train (RTR Module)







GROUP-35 , Summer Defense 2016

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Contents

Biomedical Engineering

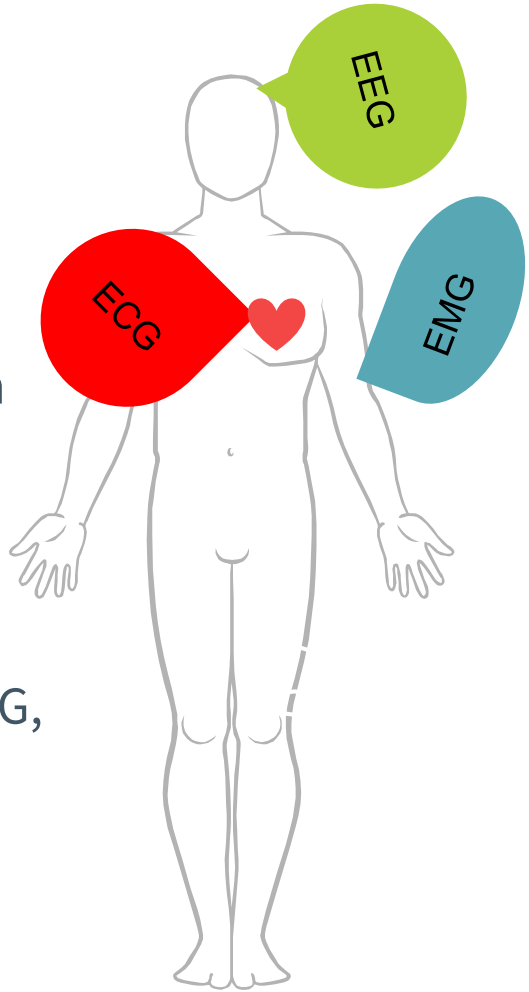
Biomedical engineers (BME) apply **advance engineering designing knowledge** to solve **medical challenges and design health care devices problems[1].**

- ✓ **Engineering your health**
- ✓ **Designing artificial limbs**
- ✓ **Designing medical equipment and so on….**

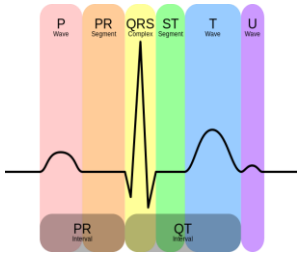
Biopotential

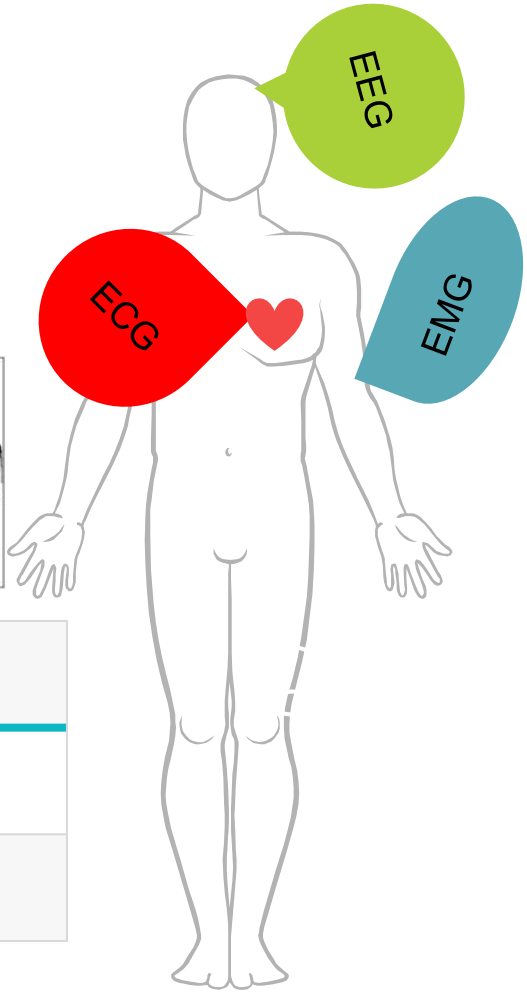
Biopotentials are electric potentials that is measured in living cells, tissues and organisms, which accompanies biochemical process [1].

There are different types of biopotentials in different parts of human body Different biopotential are ECG, EEG, EMG, EOG, AAP etc.



Biopotential

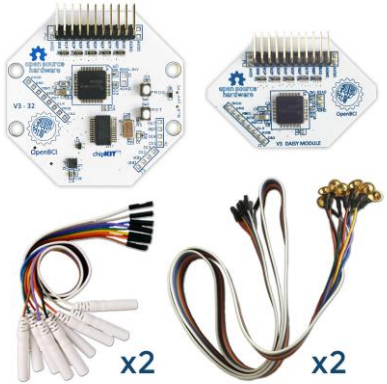




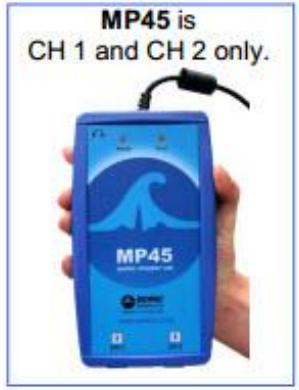
	ECG	EEG	EMG
Amplitude (mV)	**1-5**	**0.001-0.01**	**1-10**
Bandwidth (Hz)	**0.5-100**	**0.5-40**	**200-2000**

“Problems with the biopotential lab’s equipment”

Available Laboratory Devices

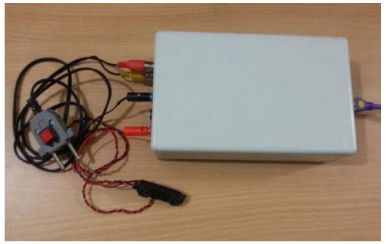


a) R&D kit [3].



b) Biopac ECG100C [4].

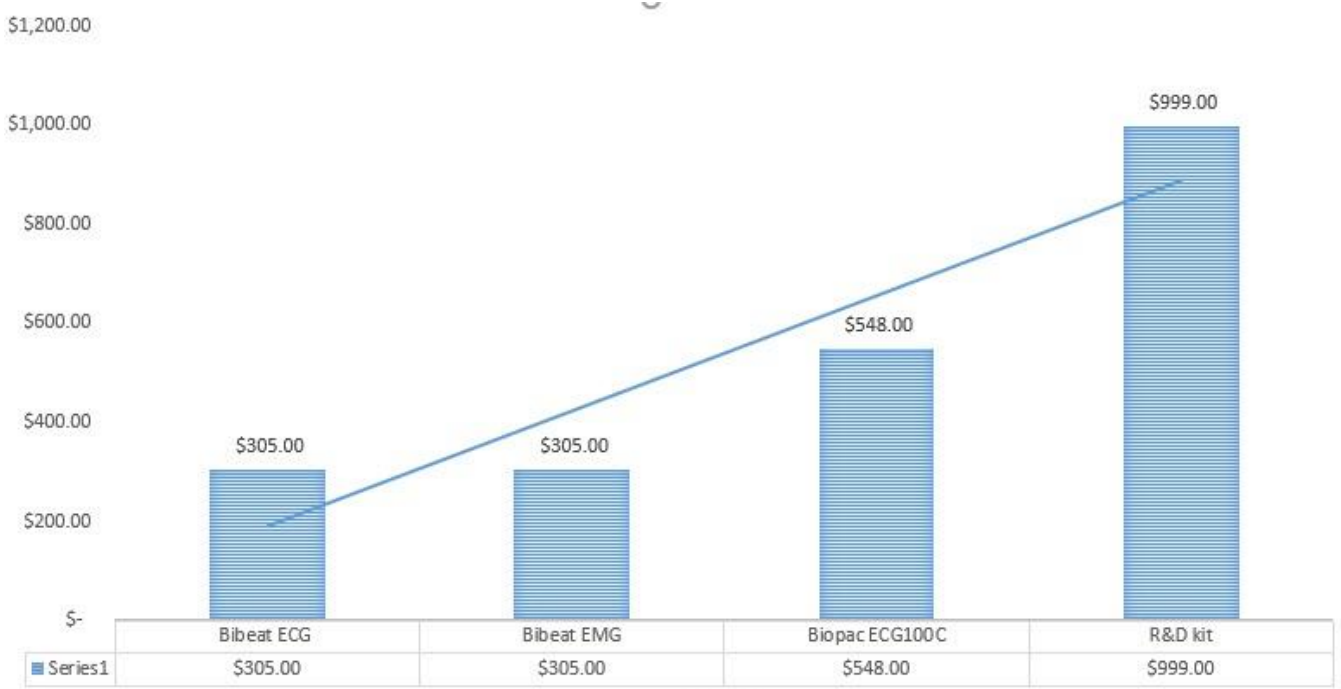
D)BiBeat ECG kit [5].



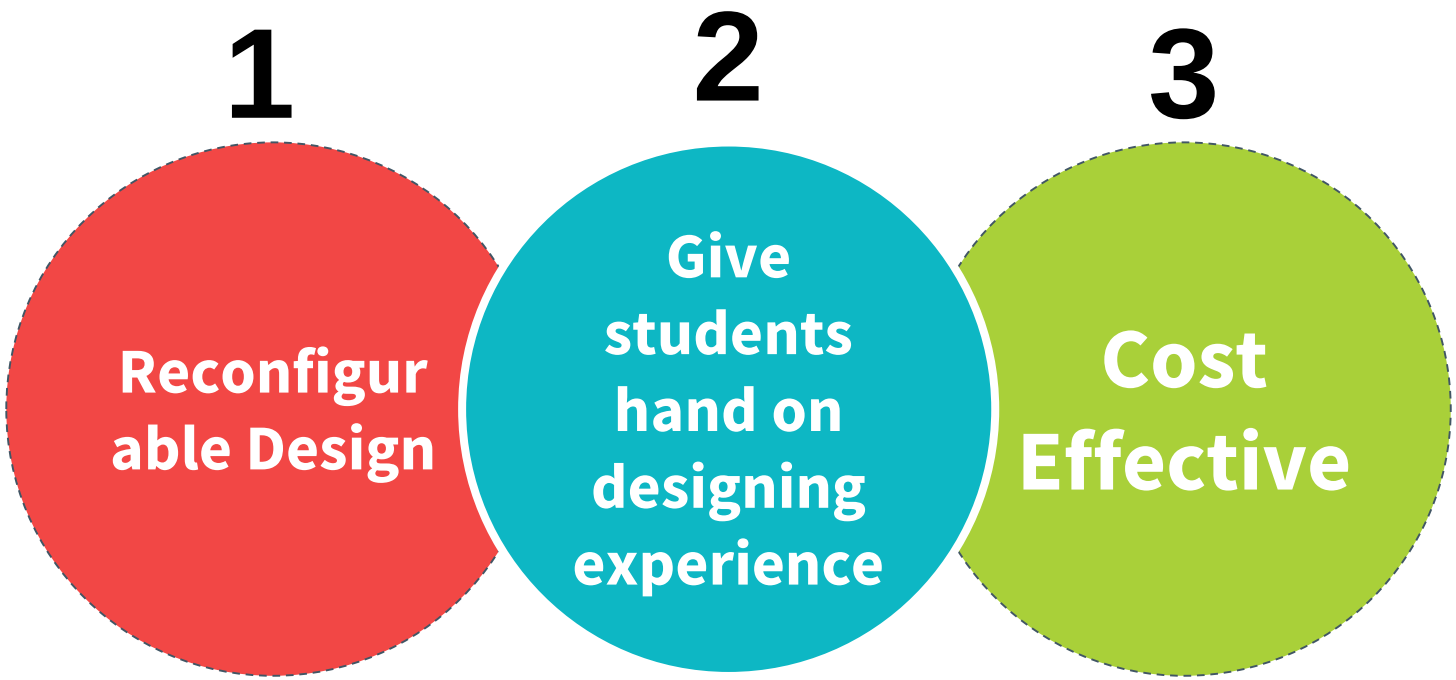
D)BiBeat EMG kit [3].

Fig.1: Biopotential lab devices.

High Cost


$1,200.00
$1,000.00
$800.00
$600.00
$400.00
$200.00
$-
$305.00
$305.00
$548.00
$999.00
Bibeat ECG
Bibeat EMG
Biopac ECG100C
R&D kit
Series1
$305.00
$305.00
$548.00
$999.00

IDEA OF THE PROJECT



BLOCK DIAGRAM OF THE PROJECT

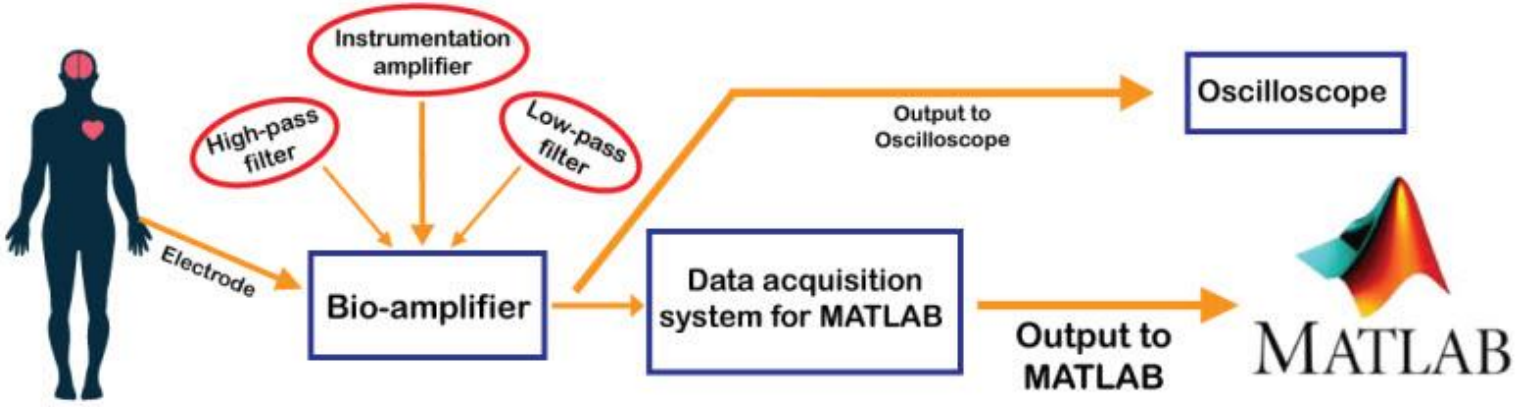


Fig.2: Block diagram of the project.

BLOCK DIAGRAM OF THE RTR MODULE

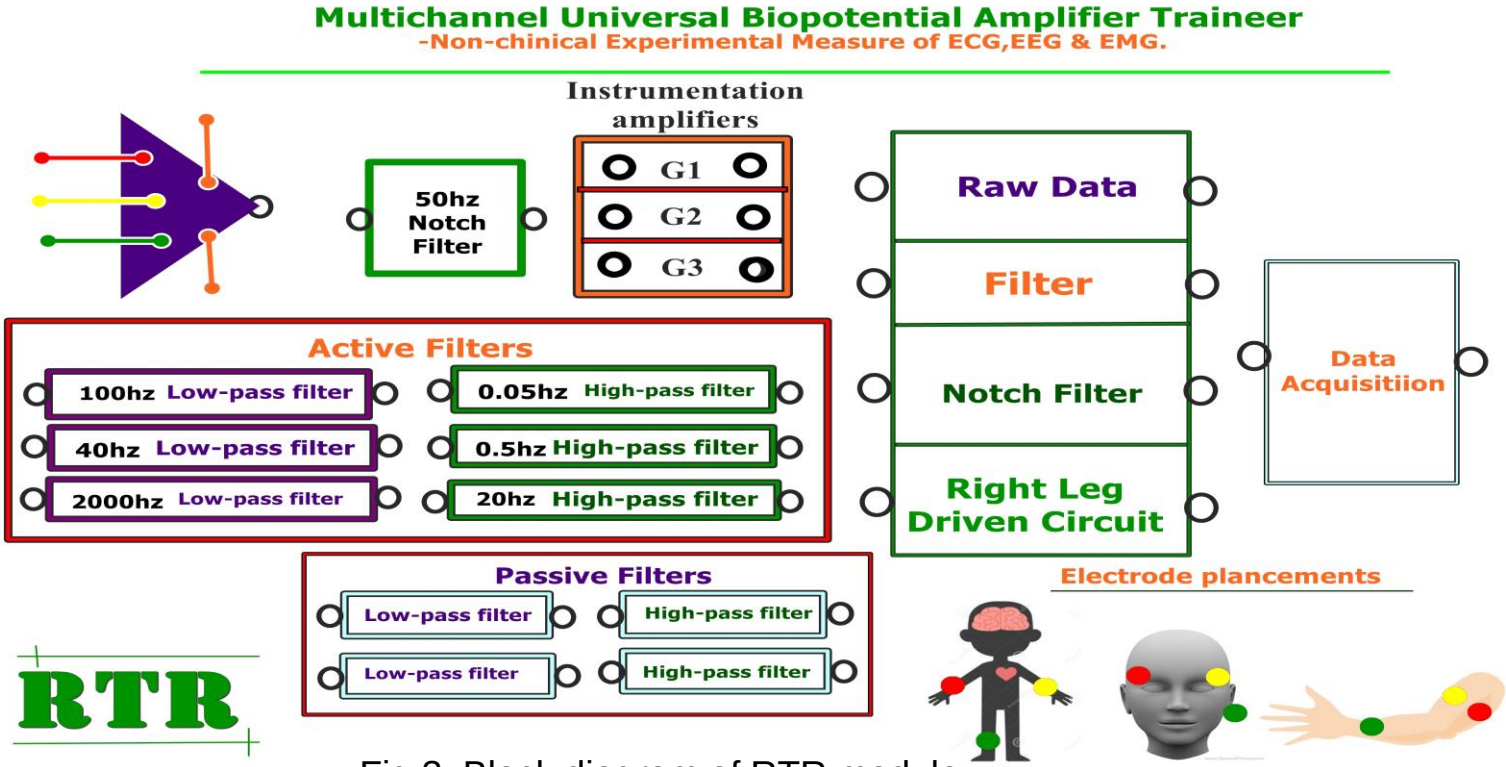
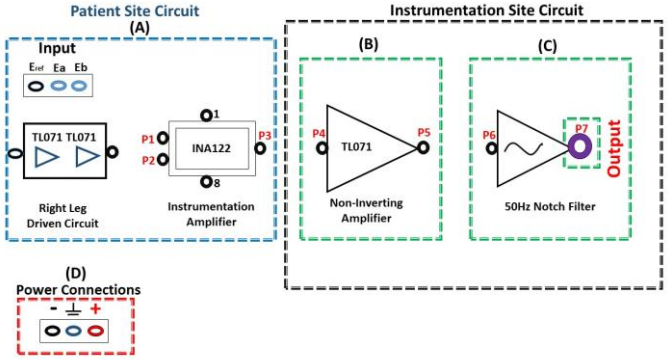
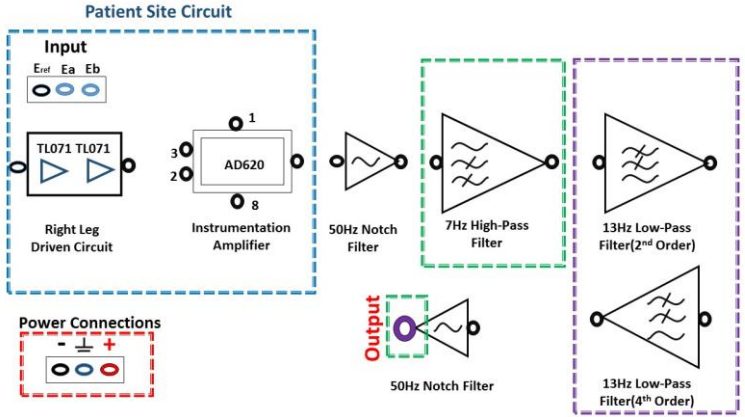


Fig.3: Block diagram of RTR module.

BLOCK DIAGRAM OF THE CONFIGURATION

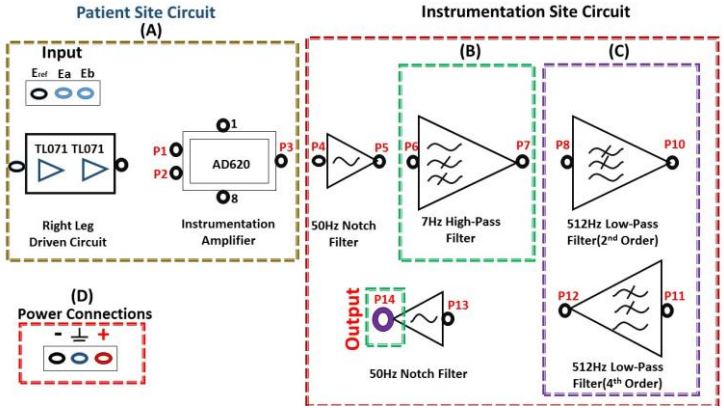


a) ECG Configuration



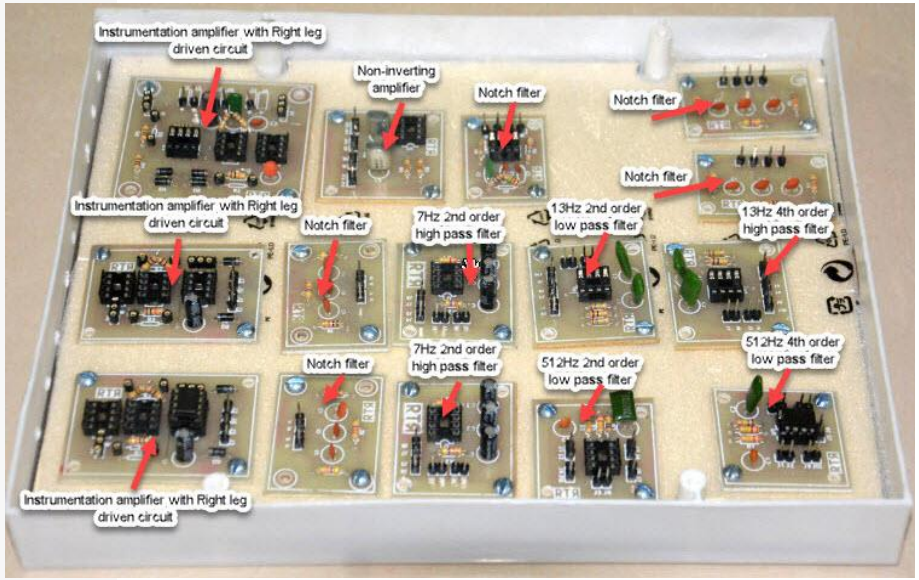
b) EEG Configuration

Fig.4: Configuration Block diagram of the RTR module for acquiring biosignals.



c) EMG Configuration

DESIGNED PROTOTYPE



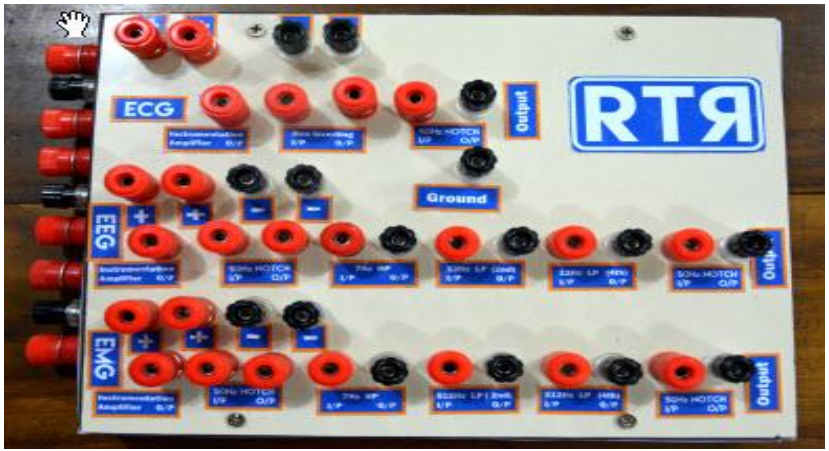


Fig.5: Prototype of RTR Module.

HAND-ON DESIGNING EXPERIENCE

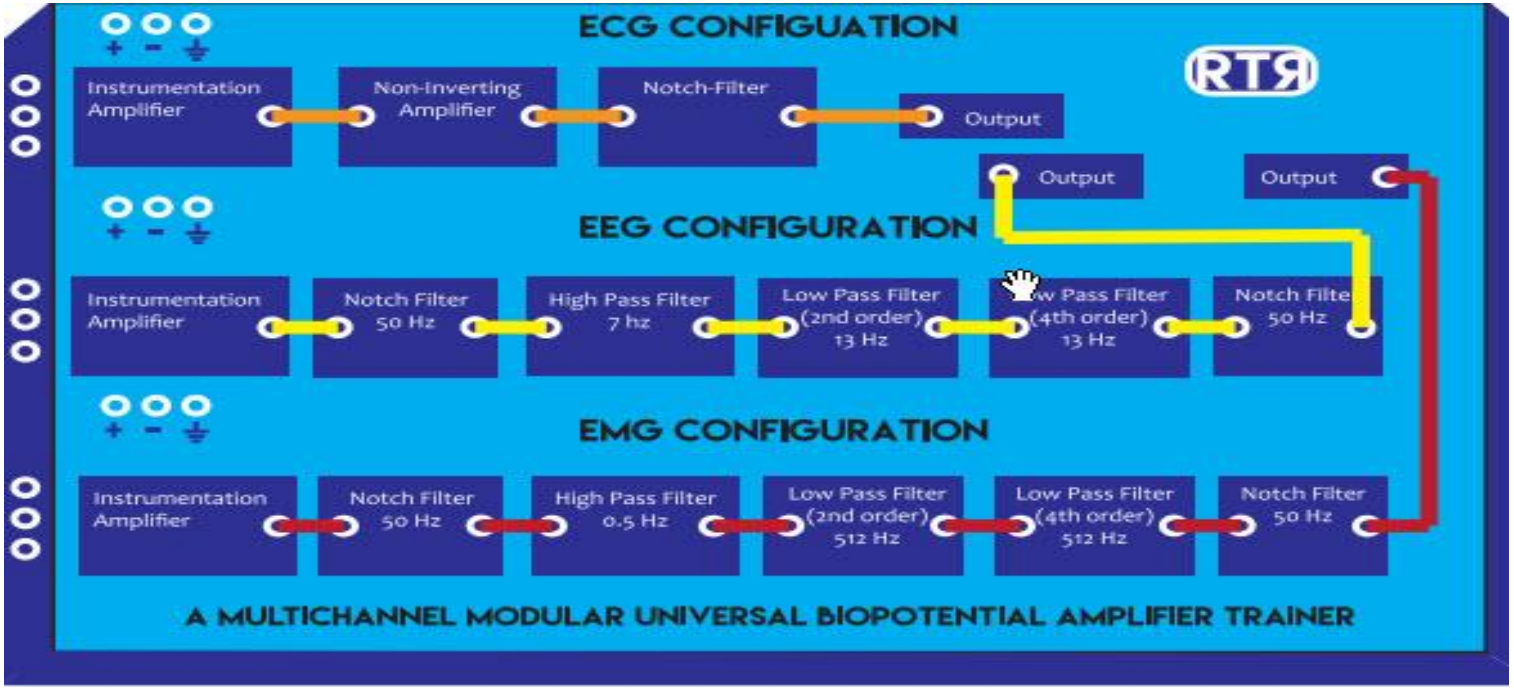
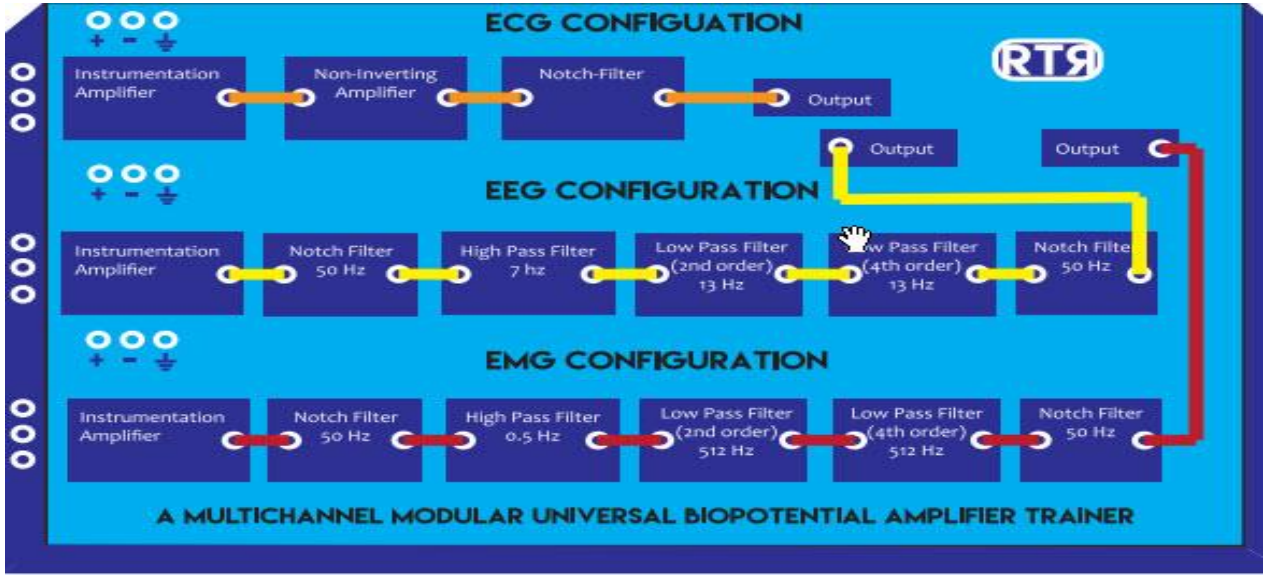
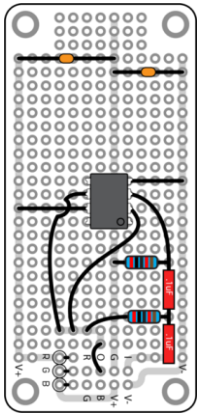


Fig.6: Connection configuration.

HAND-ON DESIGNING EXPERIENCE



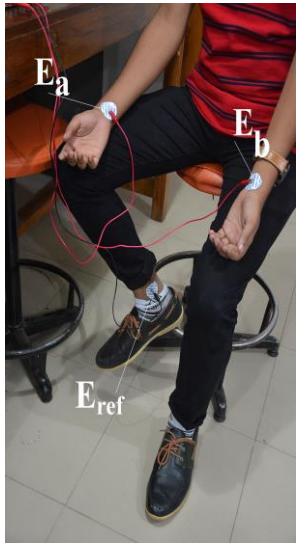
a) RTR Module.



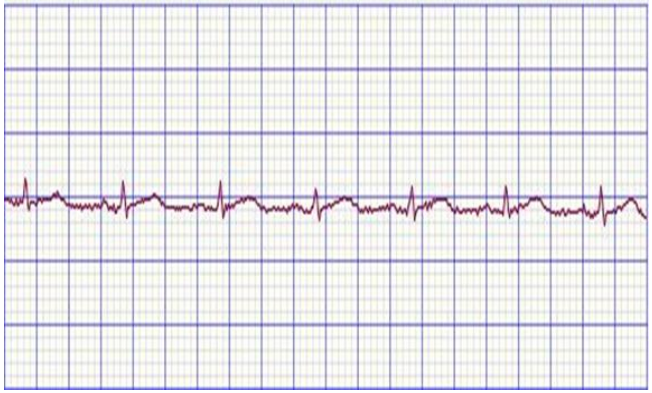
b) Breadboard filter design

Fig.7: Connection configuration with circuit made in breadboard.

ECG MEASUREMENT



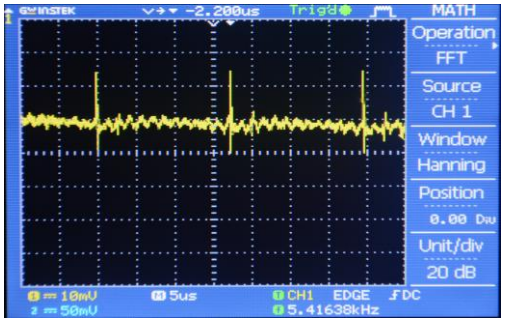
(a) Electrode placement.



(b)Non-clinical experimental output collected from Bi-Beat[2].

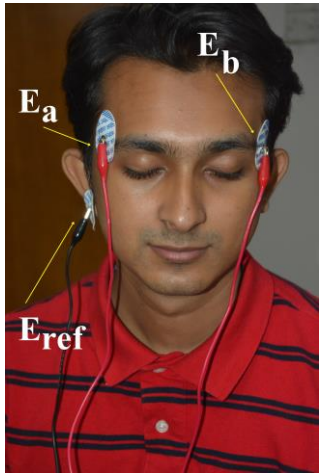
(c) ECG output.

Fig.8: ECG measurement.

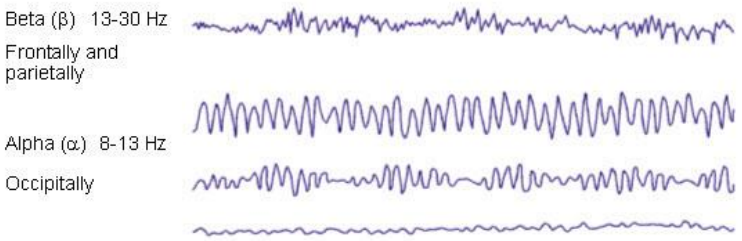


(c) ECG output.

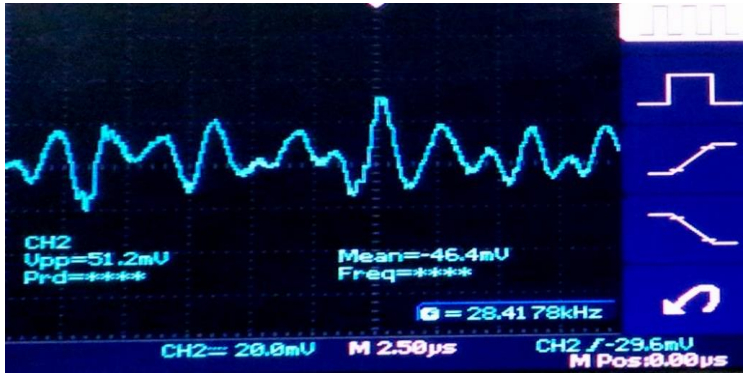
EEG MEASUREMENT



(a) Electrode placement.



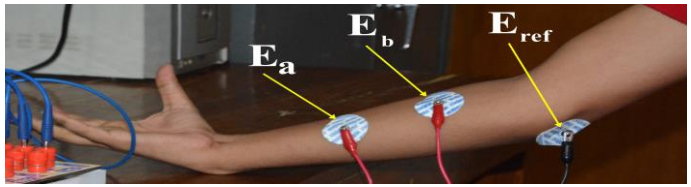
(b) Standard Alpha & Beta range of EEG[1].



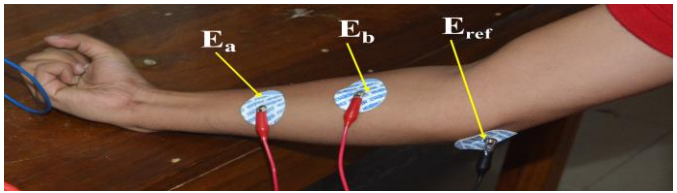
(c) EEG output.

Fig.9: EEG measurement.

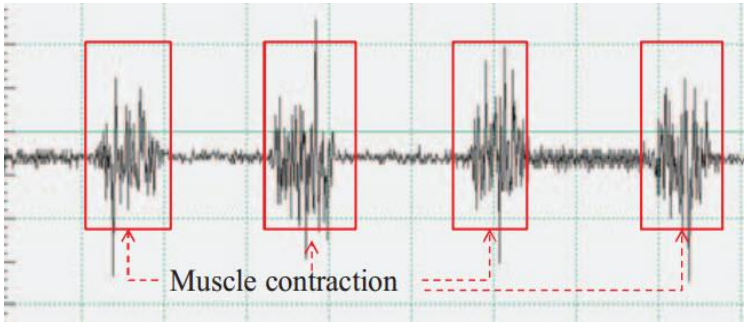
EMG MEASUREMENT



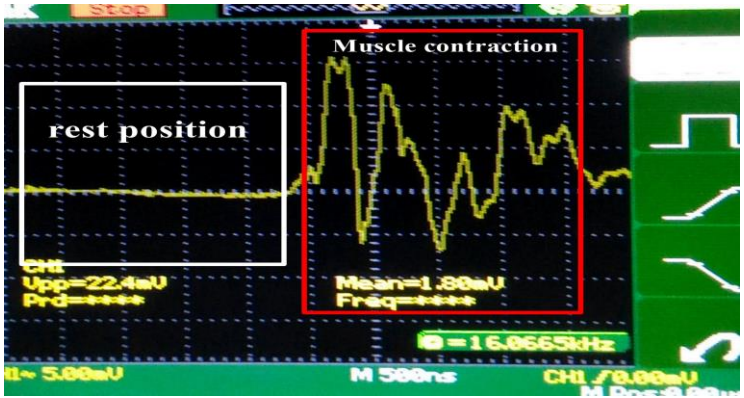
(a) Electrode placement and rest position



(b) Electrode placement a compressed position



(c) Non clinical EMG output[2].



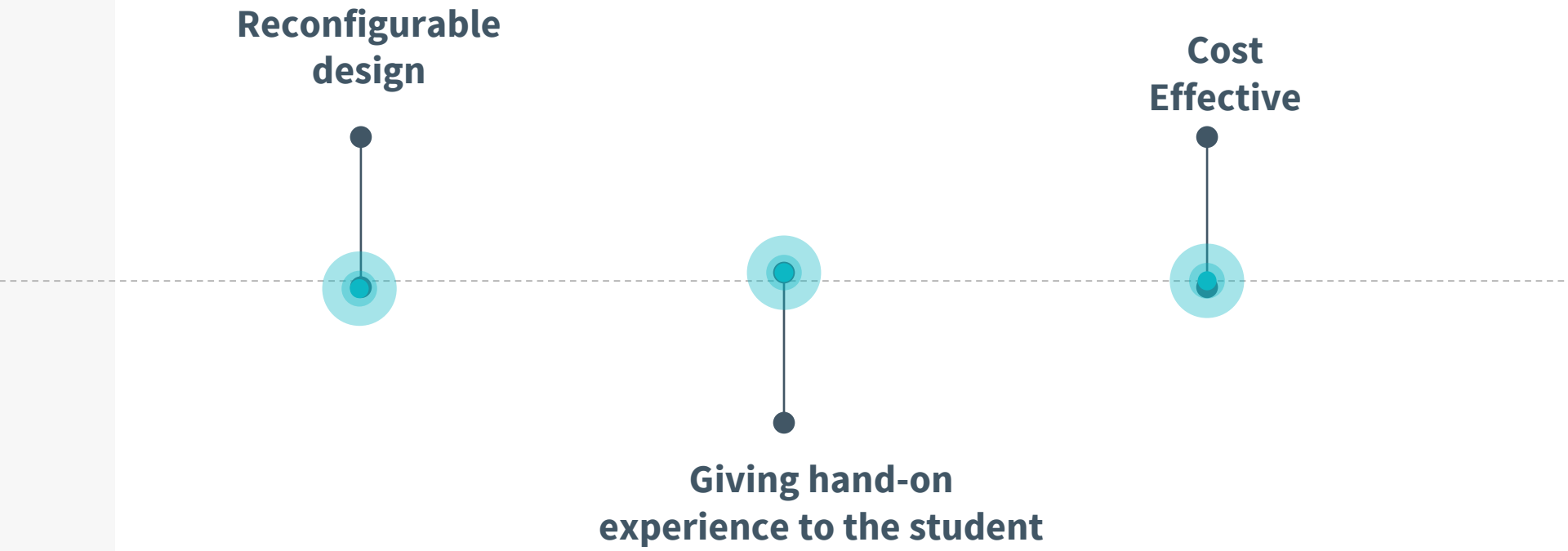
(d) EMG output.

Fig. 10: EMG measurement.

Cost

Equipment	Cost (TAKA)
PCB Printout and Soldering	3500
RTR Box	2500
Op-Amps	2000
Circuit Equipment	2000
Electrodes and other wires	1000
Data Acquisition system	800
Total	11800TK / $143

Target achievements



SOFTWARE ALTERNATIVE

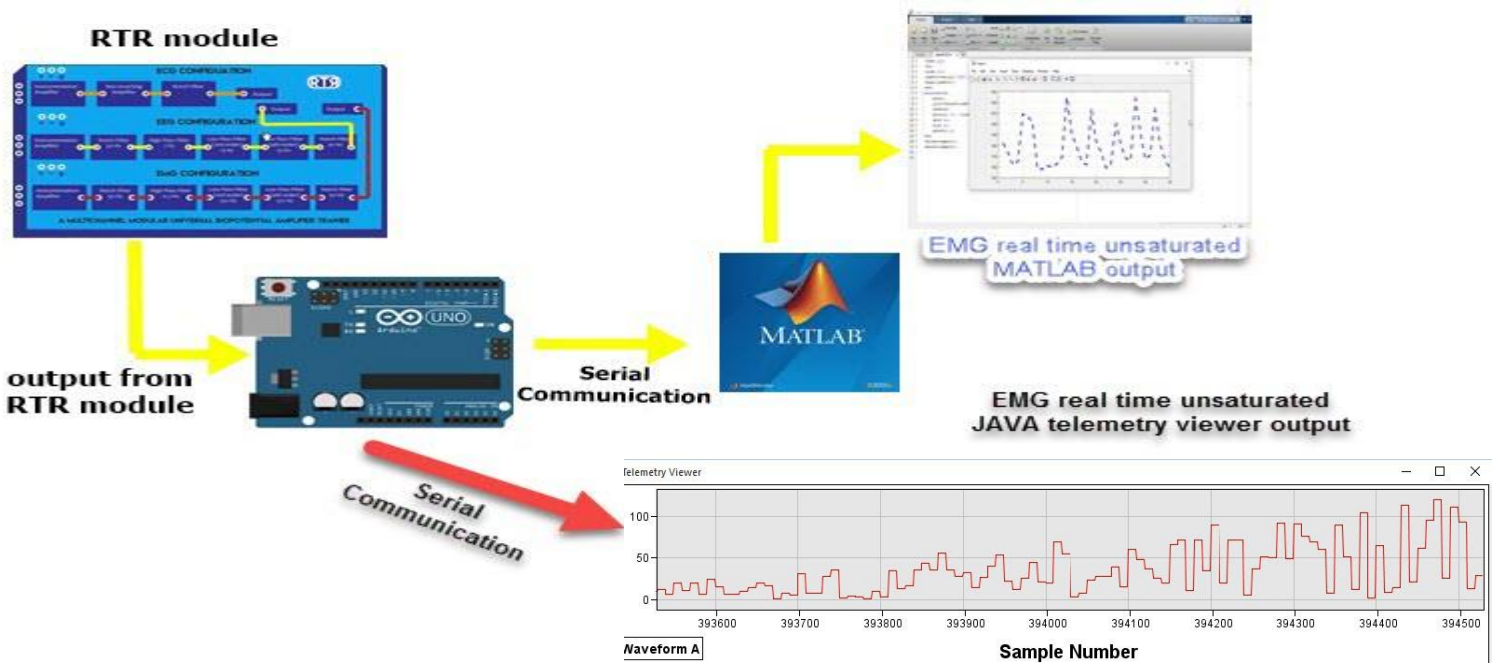


Fig.11: Software alternative.

LIMITATION & SOLUTION

For medical equipment is good to have the tolerance level of **0.1%** ,where we had used resistance of **5%-10%** tolerance due to the lacking of SMD implementation limitation.

For over come the limitation we are coming with the

“RTR module 2.0”

“RTR MODULE 2.0”

Cost Approximately $250

#Start a small startup # National Patent #Catch the marker

”

50
Students

6 ?
Questions

1 to 5
Questions score

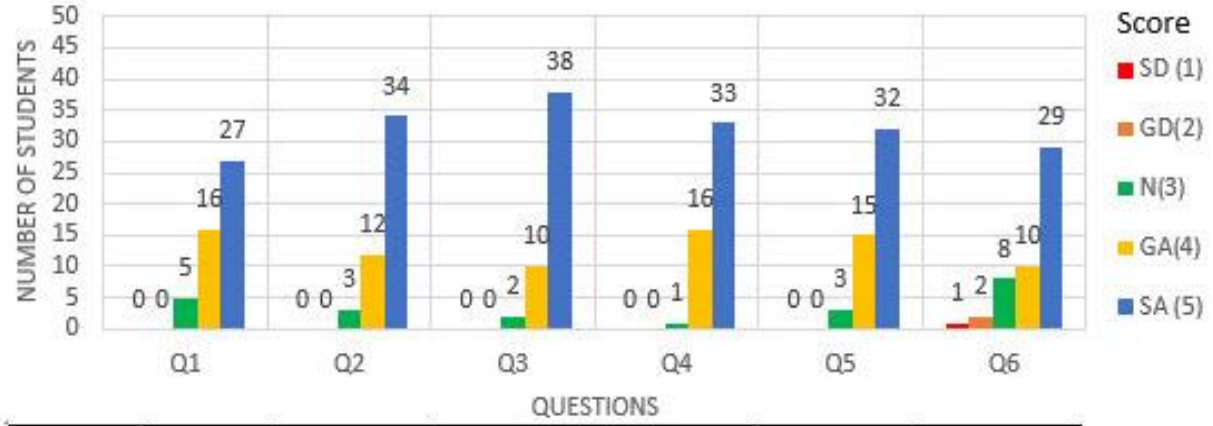
Survey on Student

SURVEY QUESTIONS

	Strongly Disagreed				Strongly Agreed
1. The **"RTR Module"** will improve medical instrumentations knowledge when compared to traditional lecture courses.	1	2	3	4	5
2. This **"RTR Module"** will provide more practical knowledge and technologies for medical instrumentations.	1	2	3	4	5
3. You can relate the **RTR Modules** instrumentation with your theoretical knowledge.	1	2	3	4	5
4. **RTR Modules** step by step filtering options give you more clear ideas about bio-amplification and filtering.	1	2	3	4	5
5. **RTR Module** is giving more improved in hands-on skills of medical instrument design.	1	2	3	4	5
6. This **"RTR module"** will make you pay more affords on this course.	1	2	3	4	5

SURVEY RESULT

SD= Strongly Disagreed GD= Generally Disagreed N= Neutral
GA= Generally Agreed SA = Strongly Agreed



Mean	4.44	4.62	4.72	4.64	4.58	4.28
Standard Deviation	0.6681	0.5963	0.5307	0.52	0.6029	1.0008

Reference

[1] The Biosignal How-To [BPM biosignals]. 2016. The Biosignal How-To [BPM biosignals]. [ONLINE] Available at: http://biosignals.berndporr.me.uk/doku.php?id=start. Accessed 01 May 2016.

[2] BiBeat. 2016. 12 lead ECG | BiBeat. [ONLINE] Available at: http://bibeat.com/product/12-lead-ecg/. Accessed 02 May 2016.

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[5] M. E. Ltd, "Mega electronics Ltd," 2016. [Online]. Available: http://www.megaemg.com/products/. Accessed: Dec. 28, 2016.

Thank you !!!☺

ANY Question ???☺