DCS LAB REVIEW

Monitoring EMG Signal with Modulation schemes

WHAT ARE WE UPTO ?

Monitor with Precision: Arduino-Driven Bio-Signal Modulation with BIO AMP EXG Pill

We're developing a **bio-signal modulation system** using the **BIO AMP EXG Pill** with Arduino technology to measure and transmit analog bio-signal data. The system continuously reads bio-signals and applies **Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), and Phase Shift Keying (PSK)** to simulate various modulation techniques. This innovative solution demonstrates basic digital communication systems, enabling efficient data transmission and helping improve bio-signal analysis through remote capabilities.

PROBLEMS WE SOLVE

Problems We Solve:
- Dependence on manual bio-signal analysis in healthcare and research.
- Limited access to real-time bio-signal data for accurate diagnosis.
- Complexity and cost of traditional bio-signal communication systems.
- Lack of accessible tools for teaching digital modulation techniques in bioengineering.

Our Solution (USP):
- Our Arduino-driven bio-signal modulation system with the BIO AMP EXG Pill enables:
- Continuous measurement and transmission of bio-signals for real-time monitoring.
- Application of ASK, FSK, and PSK techniques for efficient, low-cost data communication.
- User-friendly, portable design, making bio-signal modulation accessible to educators and researchers.
- Enhanced accuracy in bio-signal data transmission, reducing reliance on expensive equipment.
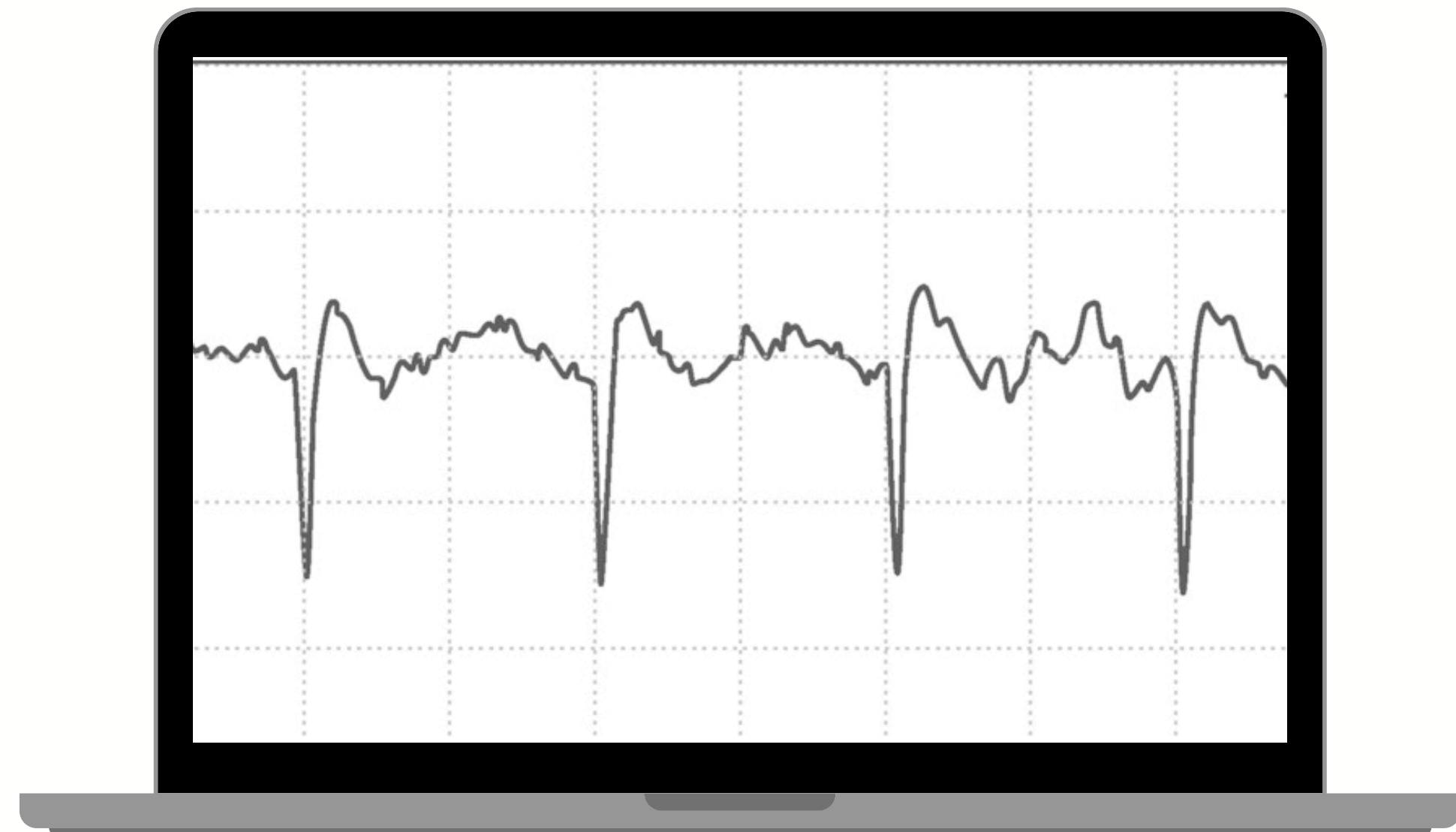
OUR SOLUTION

Our Arduino-Driven Bio-Signal Modulation System utilizes the BIO AMP EXG Pill to empower researchers and educators in bio-signal monitoring and communication. It provides continuous real-time bio-signal tracking, applies digital modulation techniques like ASK, FSK, and PSK, and offers remote data transmission for enhanced accessibility. This innovative approach facilitates accurate signal interpretation, supports digital communication training, and reduces equipment costs.

USP:

- Continuous real-time bio-signal measurement and modulation.
- Automated data modulation for improved bio-signal analysis.
- Remote monitoring capabilities for seamless bio-data access.
- Enhanced research potential and reduced dependency on costly equipment.
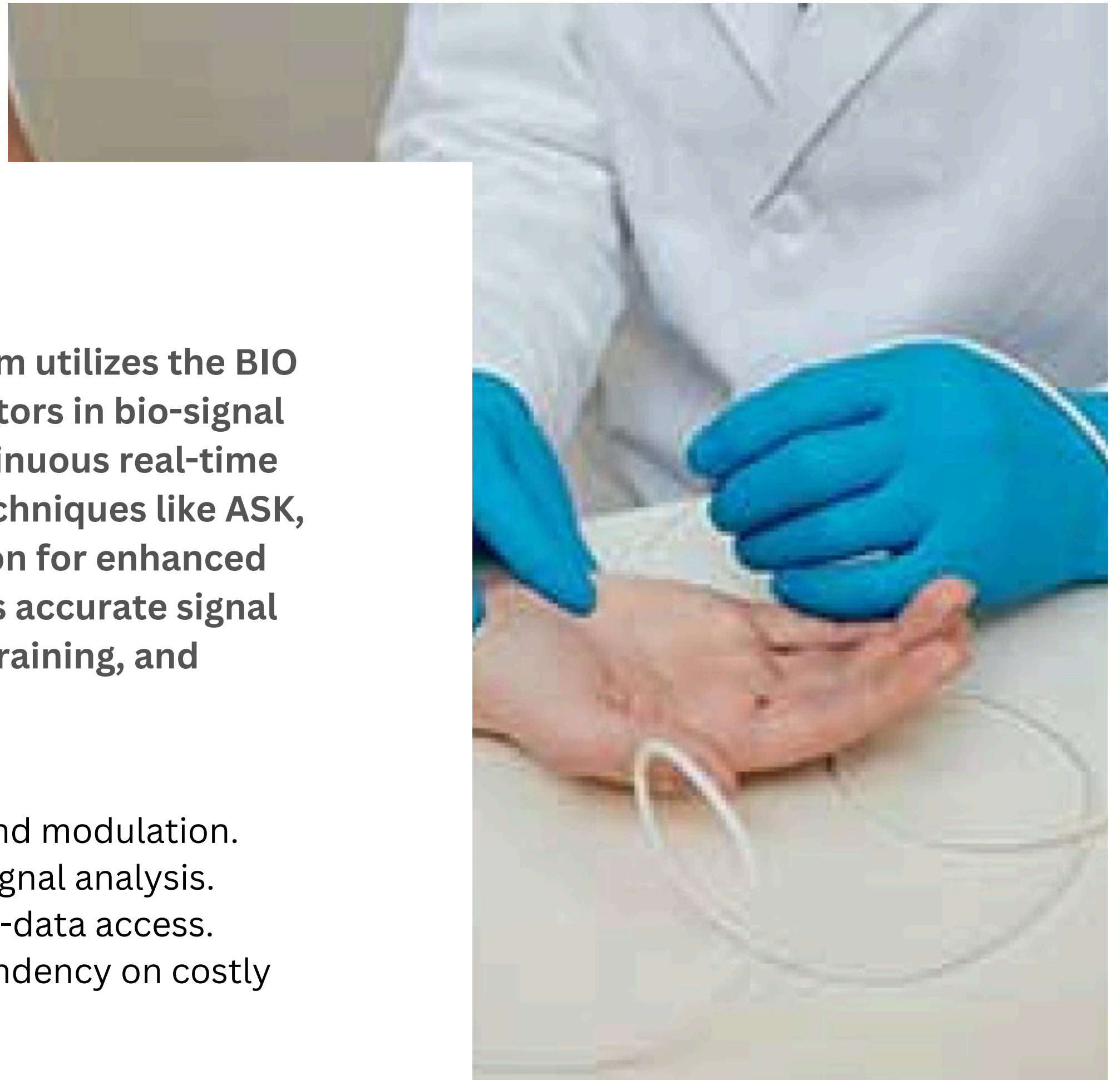
Hardware Components:

• **Arduino Microcontroller** – Central unit for data processing and control.

• **BIO AMP EXG Pil**l – Captures bio-signals for modulation and analysis.

• **Breadboard and Jumper Wires** – For prototyping and connections.

• **Power Supply** – Powers the Arduino and connected components.

Software Components:

• **Arduino IDE** – Platform for coding and uploading programs to Arduino.

• **Libraries for Digital Modulation** – Implements ASK, FSK, and PSK techniques.

• **Data Storage** – Records and stores bio-signal data for analysis.

Setup Components:

 • **Arduino Microcontroller:** Acts as the main control unit for data processing and modulation.
 • **BIO AMP EXG Pill:** Captures real-time bio-signals.

User Notification:

The Serial Monitor in the Arduino IDE displays real-time updates on modulation type and signal strength, providing immediate feedback.

Continuous Feedback:

The system operates in real-time, maintaining efficient data communication and enhancing bio-signal analysis.

Data Acquisition:

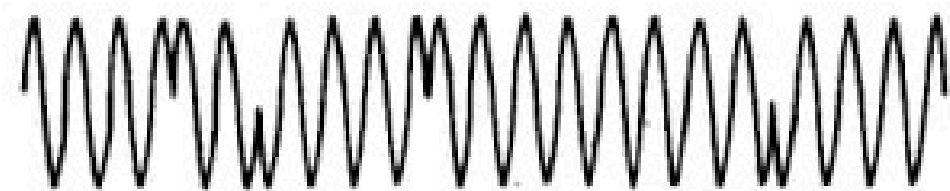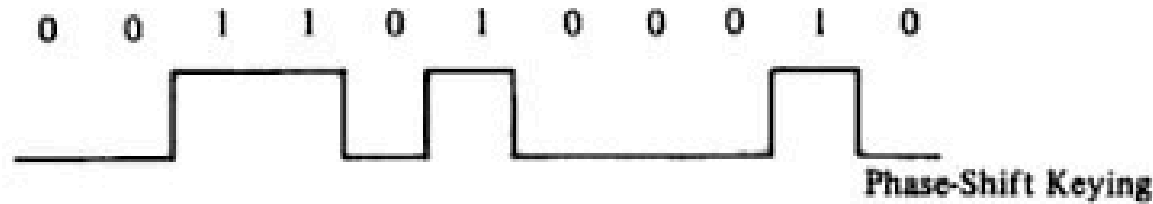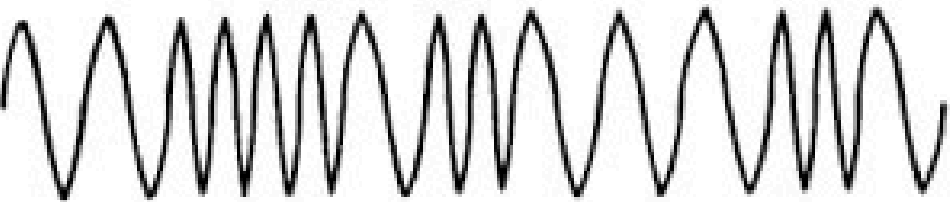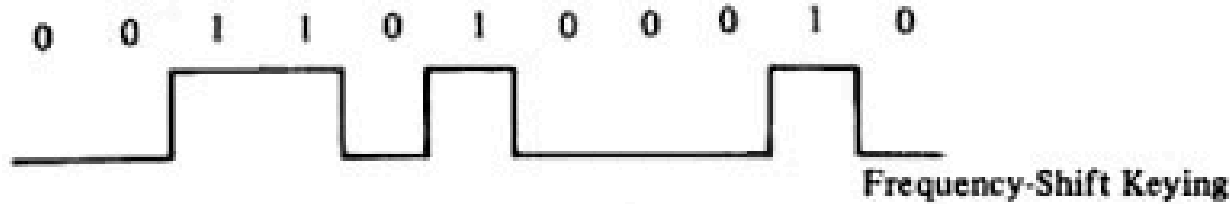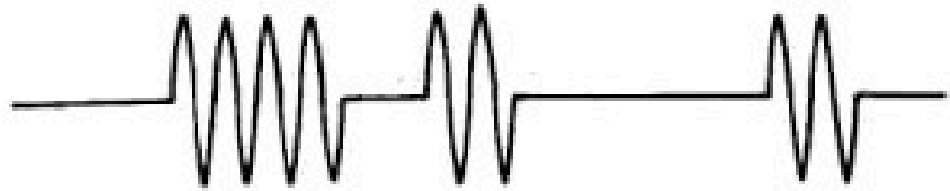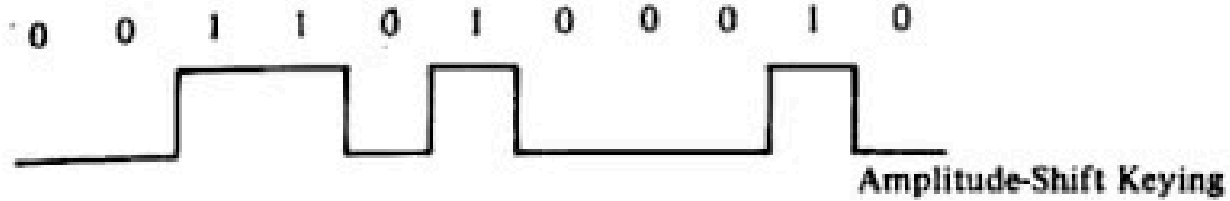The BIO AMP EXG Pill captures bio-signals and sends data to the Arduino.

Data Processing:

Arduino processes the bio-signal data and applies digital modulation techniques such as Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), and Phase Shift Keying (PSK).

Decision Making:

Modulation thresholds are applied, adjusting signal properties based on bio-signal strength and type (e.g., switching frequencies for FSK).
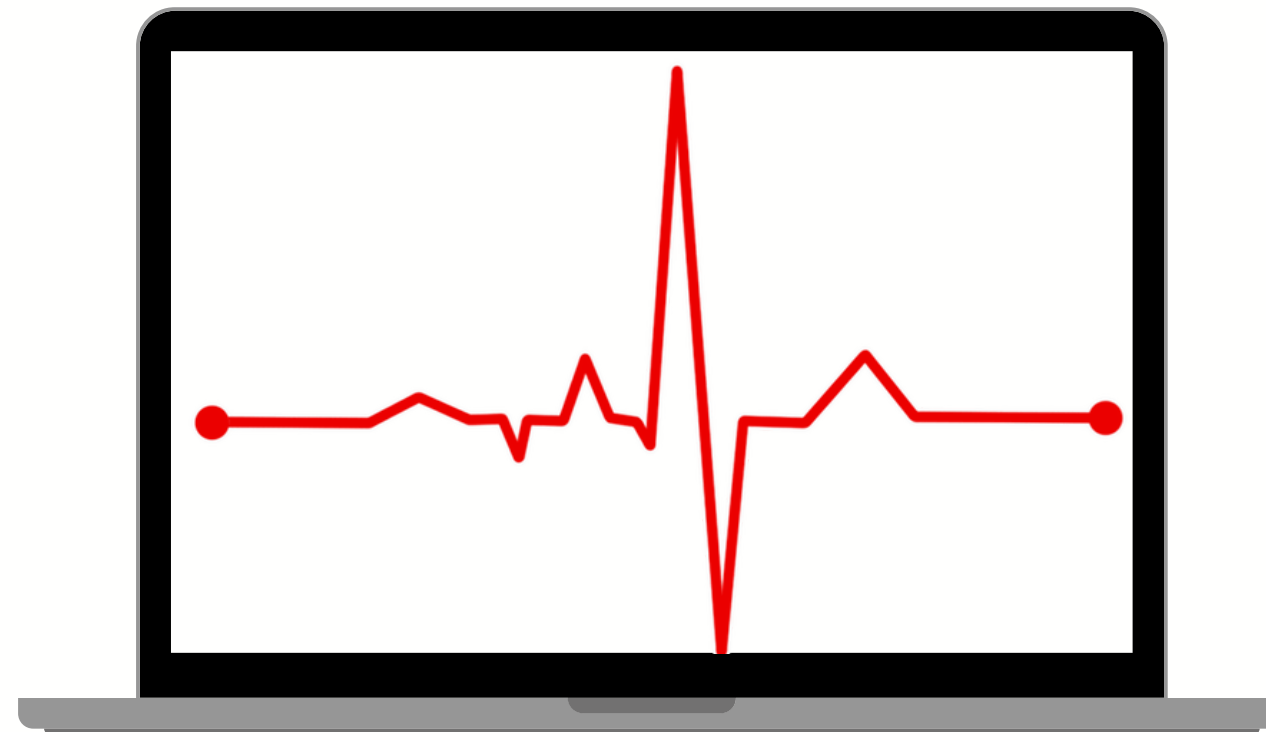
Block Diagram

Block Diagram

Features

Focus on the BIO AMP EXG Pill

- This bio-signal sensor is ideal for capturing electrical signals from muscles and nerves, used in health monitoring and research.
- Provides high-quality analog signals compatible with Arduino for flexible data processing.

Overview of Bio-Signal Modulation

- Enables efficient transmission of bio-signals using digital modulation techniques.
- Cost-effective approach to studying bio-signals in real-time, making it accessible for educational and research applications.

Need for Modulation Systems

- Manual bio-signal analysis is time-consuming and limits data accuracy.
- Automated modulation with Arduino simplifies real-time bio-signal monitoring and enhances accessibility for training and experimentation.

Importance of Digital Modulation

- Enhances accuracy in bio-signal data transmission, essential for applications in healthcare and bioengineering.
- ASK, FSK, and PSK modulation techniques simulate different signal properties for more versatile data communication.

Conclusion

The system functions as a **real-time feedback mechanism**, continuously monitoring bio-signals captured by the **BIO AMP EXG Pill**. Leveraging this bio-signal data, the Arduino microcontroller applies **modulation techniques** to transmit information accurately and effectively. This setup enhances data accessibility for research, improves the efficiency of bio-signal analysis, and simplifies digital communication processes in bioengineering and health monitoring applications.

Thank You