



**A TECHNICAL REPORT ON  
STUDENTS INDUSTRIAL WORK EXPERIENCE SCHEME  
(SIWES)**

**HELD AT:  
MECHANICAL ENGINEERING DEPARTMENT AT KWARA  
STATE POLYTECHNIC'S MINI-CAMPUS**

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POLYTECHNIC**

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## **ACKNOWLEDGEMENTS**

My sincere gratitude goes to Mechanical Engineering Department, Kwara State Polytechnic for providing an exceptional platform for professional growth during my SIWES internship. The nurturing environment cultivated by the Department not only facilitated insightful learning but also fostered a spirit of collaboration and support.

## **DEDICATION**

This report work is dedicated to the Almighty God, the creator of the universe, the one who made me whom I am today, also to all those that have been there for me from the beginning of this four month program.

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## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 INTRODUCTION TO SIWES**

##### **1.1.1 Brief History of SIWES**

Founded in 1973 to address the mismatch between university education and industry needs, the Students' Industrial Work Experience Scheme (SIWES) equips students with practical skills crucial for employment. Recognizing the lack of practical exposure in science and technology programs, SIWES was established to bridge the gap between theory and the workplace.

Prior to SIWES, employers lamented the lack of practical experience among graduates. This prompted the Industrial Training Fund (ITF) to design and launch the scheme in 1974. Initially fully funded by the ITF, the scheme's responsibility shifted to the National Universities Commission and National Board for Technical Education in 1979 due to financial constraints. In 1984, supervision and implementation returned to the ITF, with full government funding in 1985.

##### **1.1.2 Objectives of SIWES**

The objectives of SIWES programme include to:

- Provide an avenue for students in Institutions of higher learning to acquire industrial skills and experience in their respective courses of study.
- Prepare students for the Industrial Work situation they are likely to experience after graduation.
- Expose students to work methods and techniques of handling equipment and machinery that may not be available in their Institutions.
- Make the transition from school to the world of work easier; and enhance students' networks for later job placements.
- Provide students with an opportunity to apply their knowledge to real work situations, thereby bridging the gap between theory and practice; and

- Enlist and strengthen Employers' involvement in the entire educational process; thereby preparing the students for employment in Industry and Commerce.

### **1.1.3 Benefits and Challenges of SIWES**

#### **A. Benefits of the Scheme (SIWES)**

There are several benefits derived from SIWES, some of which are:

- It's gives opportunity for student to be in direct contract with junior, immediate and senior professional staff in the industry.
- Its gives student opportunity of getting employment if such student if such student prove himself worthy of getting employed, and for the industries to evaluate the prospective employers.
- Successful SIWES operation provides government the opportunity of reducing importation of expatriate Engineers and professional personnel.

#### **B. Challenges of the Scheme**

- Inadequate funding for the maintenance of the scheme by the Federal Government of Nigeria.
- Inadequate and ineffective supervision of students on attachment by staff of institutions and ITF either due to lack of mobility or delays in payment of supervision allowance to both the staff and students.
- Growing number of Higher Institutions increases the number of eligible courses and hence students while the relevant industries are either shutting down or lack the capacity to accept such numbers.
- Acceptance of students to institution only based on vacancy.

## **1.2 INTRODUCTION TO MECHANICAL ENGINEERING**

### **1.2.1 Background and Significance of Metallurgical Engineering**

Mechanical Engineering stands as a discipline at the intersection of science and technology, focused on the extraction, processing, and utilization of metals. The background of metallurgical engineering traces its roots to the ancient art of metalworking,

evolving into a modern, sophisticated field. Its significance lies in the pivotal role metals play in various industries, from construction to aerospace.

In the contemporary context, metallurgical engineering encompasses a broad spectrum, including the extraction of raw materials, refining processes, alloy development, and the design of materials for specific applications. The background of this field is rooted in the continuous quest for enhancing the properties of metals to meet the evolving needs of industries.

### **1.2.2 Objectives of Metallurgical Engineering**

The primary objectives of metallurgical engineering are multi-faceted. These include the exploration of efficient methods for extracting metals from ores, the development of alloys with enhanced properties, and the optimization of manufacturing processes. Metallurgical engineers aim to contribute to resource sustainability, energy efficiency, and the advancement of materials with superior characteristics.

Moreover, the objectives extend to research and innovation, seeking novel ways to improve the performance, durability, and environmental impact of metal-based products. Metallurgical engineering aims to strike a balance between technological advancements and ecological responsibility.

### **1.2.3 Scope of Metallurgical Engineering in Industry**

The scope of Metallurgical Engineering in Industry is vast and diverse. It spans across sectors such as manufacturing, construction, energy, aerospace, and automotive. Metallurgical Engineers play a crucial role in designing materials that meet specific performance requirements, ensuring the integrity and functionality of diverse products.

From the development of high-strength alloys for structural components to corrosion-resistant materials for chemical processing, metallurgical engineering is instrumental in addressing industry-specific challenges. The scope extends to research institutions, where metallurgical engineers contribute to fundamental discoveries in materials science.



#### **1.2.4 Relevance of SIWES in Mechanical Engineering**

The Student Industrial Work Experience Scheme (SIWES) holds profound relevance in the education of Mechanical Engineering students. It serves as a bridge between theoretical knowledge gained in academic settings and the practical applications encountered in real-world industrial environments.

SIWES provides students with a firsthand understanding of the challenges and opportunities within the field of metallurgical engineering. Exposure to industry practices enhances their problem-solving skills, cultivates a professional mindset, and fosters adaptability to the dynamic nature of the workplace.

Furthermore, SIWES allows students to witness the direct application of metallurgical engineering principles, reinforcing classroom concepts and enriching their learning experience. Through hands-on engagement with industrial processes and machinery, students develop a holistic perspective on their chosen field, preparing them for future roles as proficient mechanical engineers.

## CHAPTER TWO

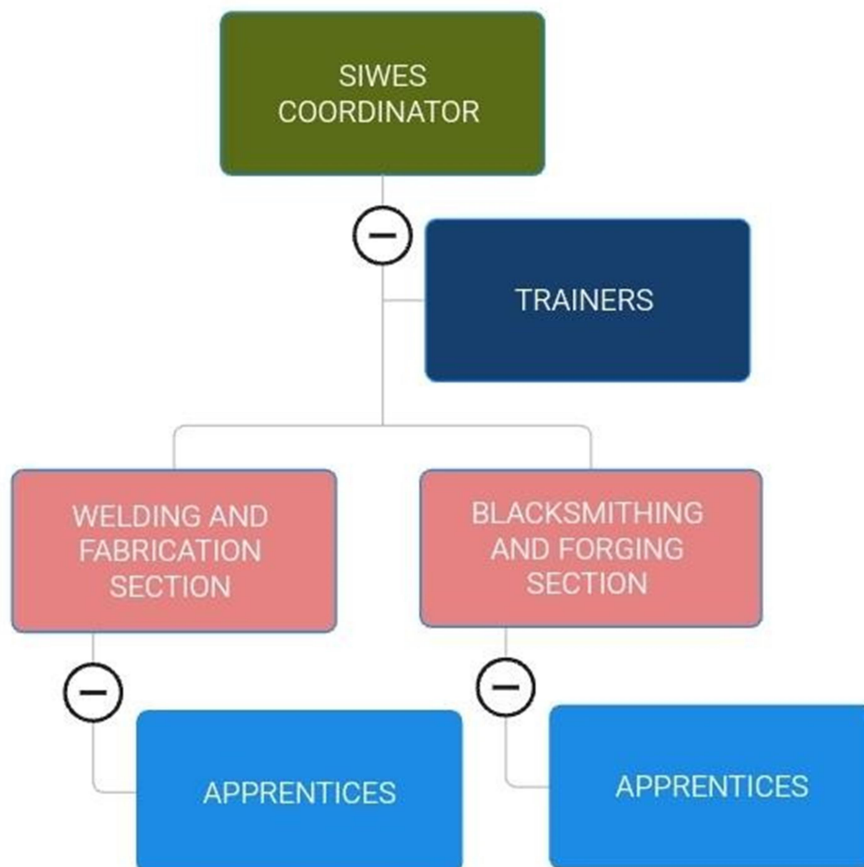
### PLACE OF ATTACHMENT OVERVIEW

#### 2.1 BACKGROUND OF THE PLACE OF ATTACHMENT

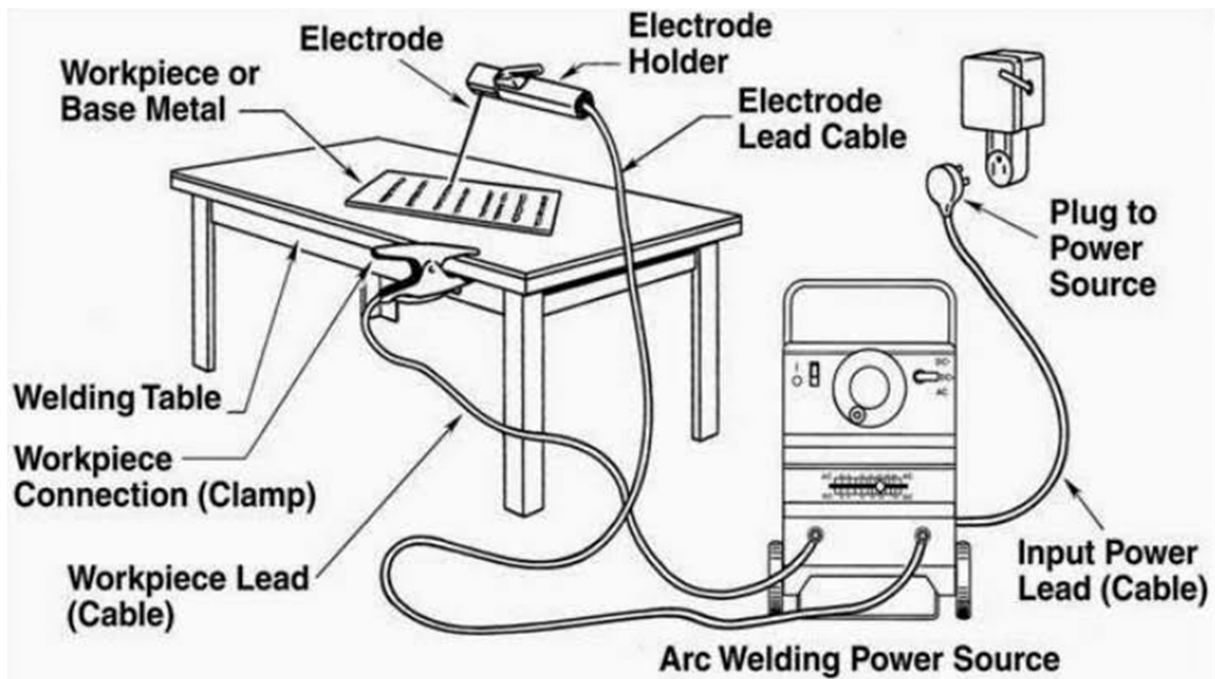
The Mechanical Engineering Department at Kwara State Polytechnic's mini-campus serves as the focal point for my SIWES experience. Established to provide hands-on training and practical exposure to students, the department has evolved as a hub for mechanical engineering activities within the academic setting.

With a foundation deeply rooted in the educational mission of Kwara State Polytechnic, the department's historical background showcases a commitment to equipping students with practical skills essential for their future careers. The establishment of the Mechanical Engineering Department aligns with the institution's dedication to fostering a holistic learning environment.

#### 2.2 ORGANIZATIONAL CHART



## 2.3 WELDING AND FABRICATION SECTION



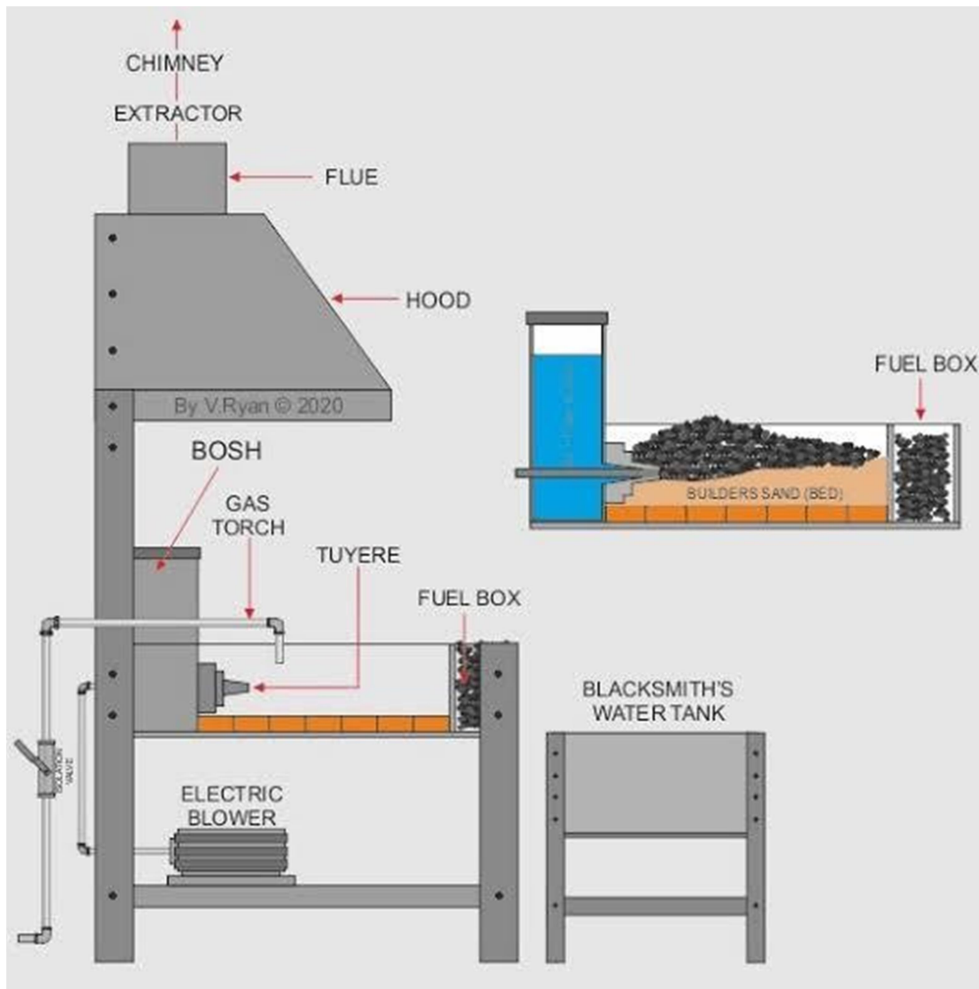
Welding, as a fundamental skill, involves the art of joining metals through various techniques such as gas welding, arc welding, and spot welding. In the Welding and Fabrication Section, students learn the nuances of these techniques, understanding how to create sturdy and precise connections between metal components. Fabrication extends this process, enabling students to transform raw materials into intricate metal structures, showcasing their creativity and technical prowess.

The Welding and Fabrication Section within the Mechanical Engineering Department at Kwara State Polytechnic's mini-campus serves as a dynamic hub where students delve into the practical applications of metallurgical engineering. This Section focuses on equipping students with skills essential for metal joining, fabrication, and the realization of diverse metal structures.

Students actively engage in practical exercises, working with a range of welding machines, including gas welding equipment and arc welding machines. The Section provides a platform for hands-on experience in welding different materials, interpreting technical drawings, and executing fabrication projects. From constructing basic structures

to intricate metal frameworks, students gain proficiency in the essential skills of welding and fabrication.

## 2.4 BLACKSMITH AND FORGING SECTION



Blacksmithing involves the manipulation of heated metals to achieve specific shapes and forms. The Forging Section focuses on the art of forging, where metals are heated and hammered into desired configurations. This section not only imparts practical skills but also fosters an appreciation for the historical significance of blacksmithing in the evolution of metallurgy.

In the Blacksmith and Forging Section, students learn to work with heated metal, understanding the principles of temperature control, hammering techniques, and the selection of appropriate tools for forging.

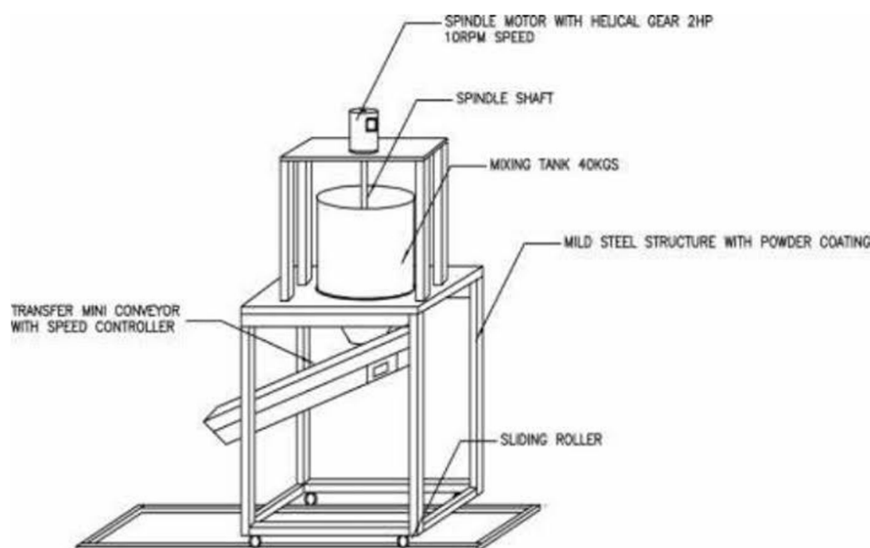
## 2.5 SPECIFIC MACHINES USED

### 2.5.1 Hydro Lift Out Crucible Furnaces



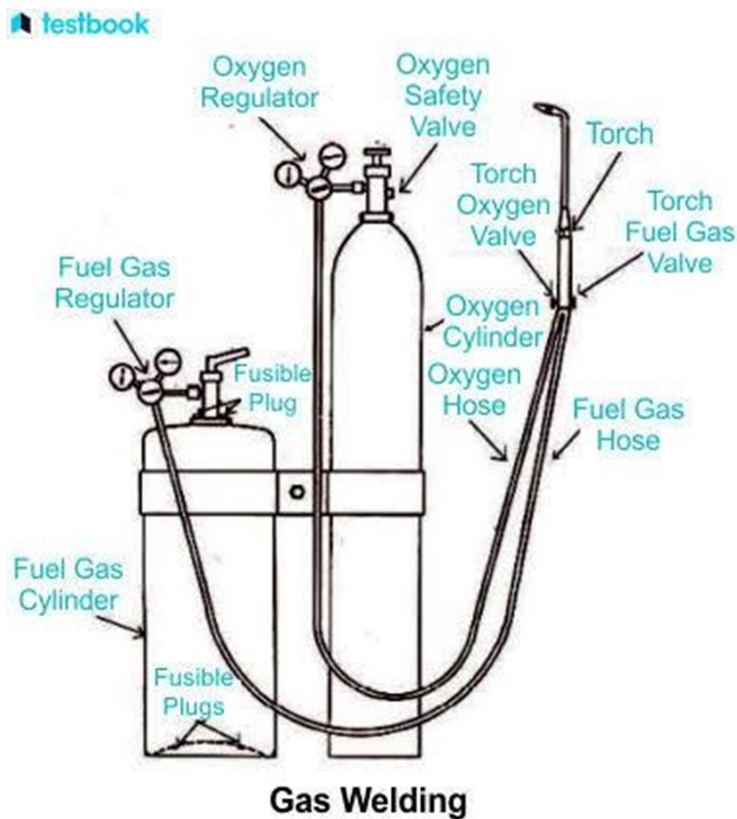
The Hydro Lift Out Crucible Furnaces stand as a cornerstone in the metallurgical processes conducted within the Mechanical Engineering Department. These furnaces play a vital role in the melting and casting of metals, offering students hands-on experience with the intricate procedures involved. The furnace's design allows for precise control of temperature and facilitates the safe handling of molten metals, contributing to a comprehensive understanding of metallurgical principles.

### 2.5.2 Sand Mixer



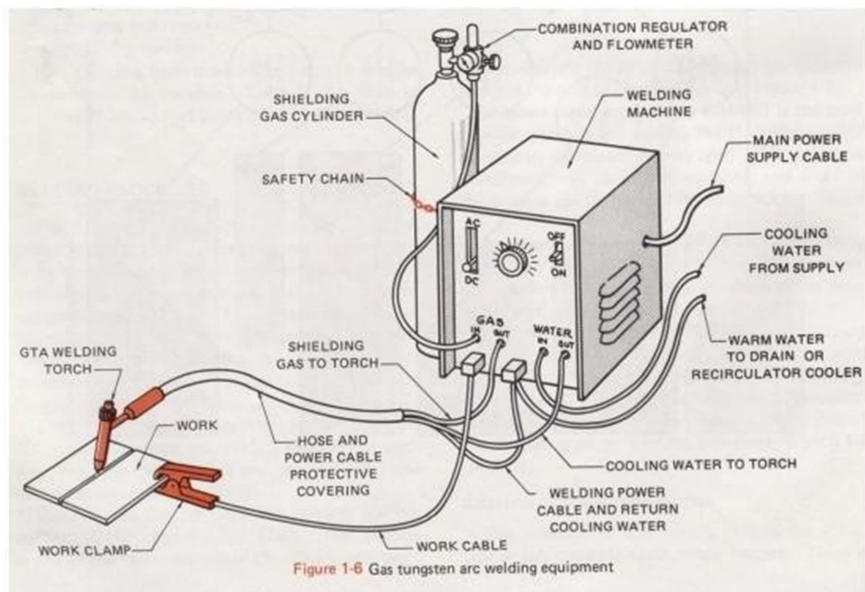
The Sand Mixer is a key component in metallurgical processes, especially in the preparation of molds for casting. Students engage with the Sand Mixer to understand the intricacies of sand preparation, a fundamental aspect of ensuring the quality and integrity of castings. The hands-on experience with the Sand Mixer connects theoretical knowledge with practical application, emphasizing the significance of proper mold preparation in metallurgical engineering.

### 2.5.3 Gas Welding Machine



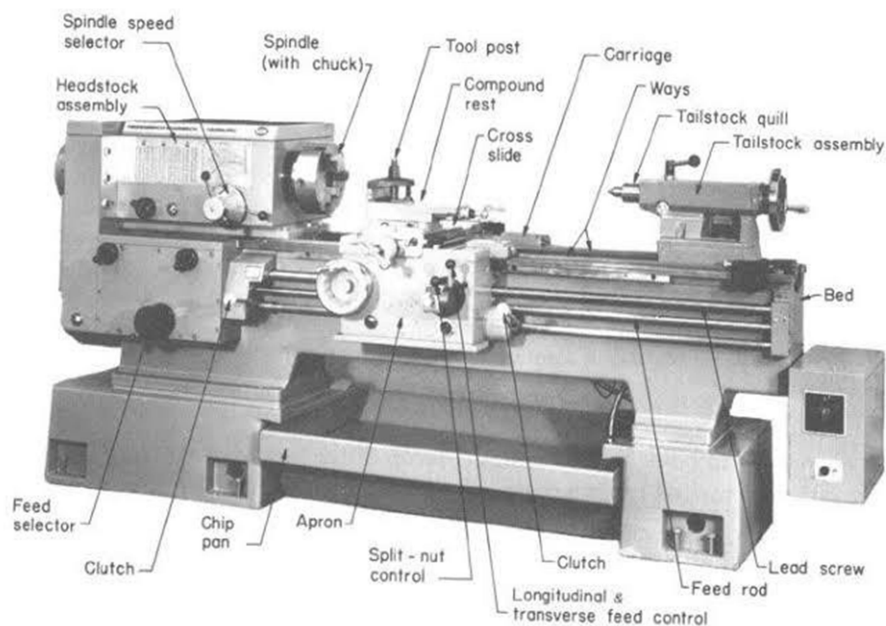
Gas welding is a foundational skill in metallurgical engineering, and the Gas Welding Machine serves as a primary tool for students to develop proficiency in this area. Through practical exercises, students gain hands-on experience with gas welding techniques, safety protocols, and the intricate art of joining metals using this versatile equipment.

## 2.5.4 Arc Welding Equipment



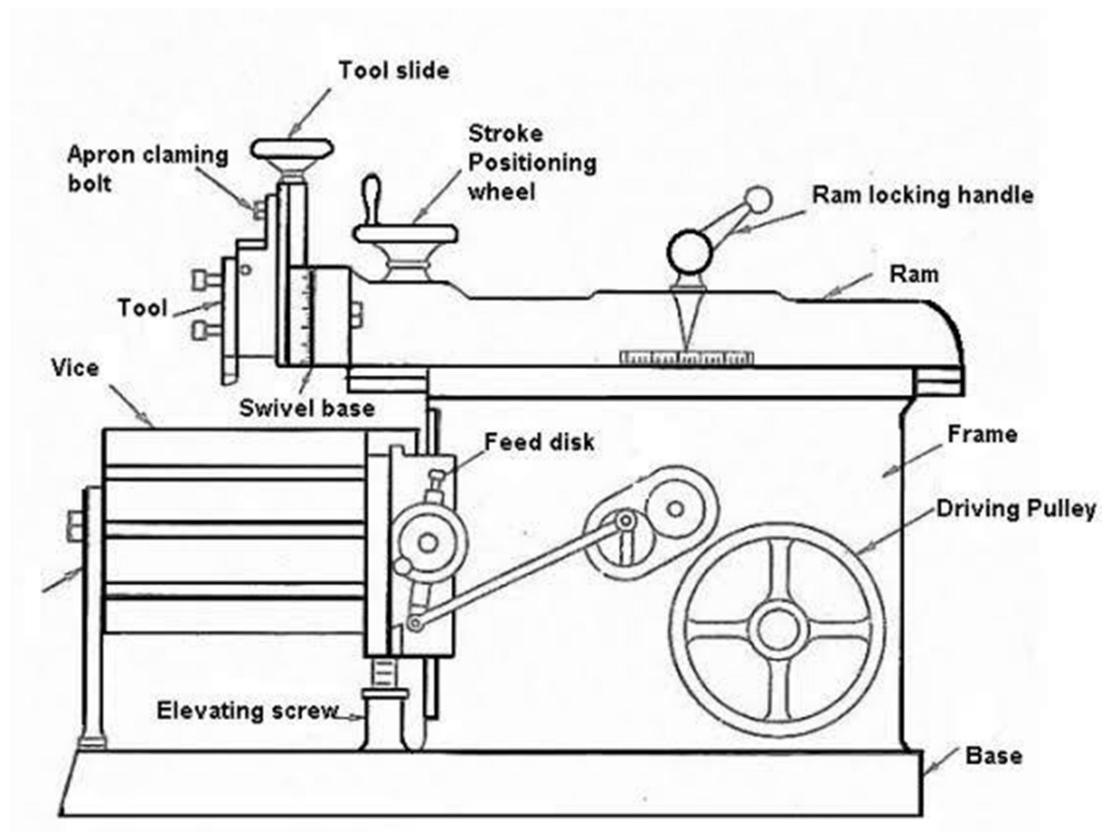
Arc welding is a cornerstone technique in mechanical engineering, and students are exposed to various types of Arc Welding Equipment. This includes welding machines that utilize different types of electrodes and welding processes. Through hands-on exercises, students acquire skills in arc welding, contributing to their ability to perform precision metal joining and fabrication.

## 2.5.5 Lathe Machine



The Lathe Machine is a versatile tool in metallurgical workshops, enabling students to perform precision turning and shaping of metals. Its application ranges from creating cylindrical components to intricate machining tasks. Students learn to operate the Lathe Machine, gaining proficiency in metalworking techniques that are fundamental to various mechanical processes.

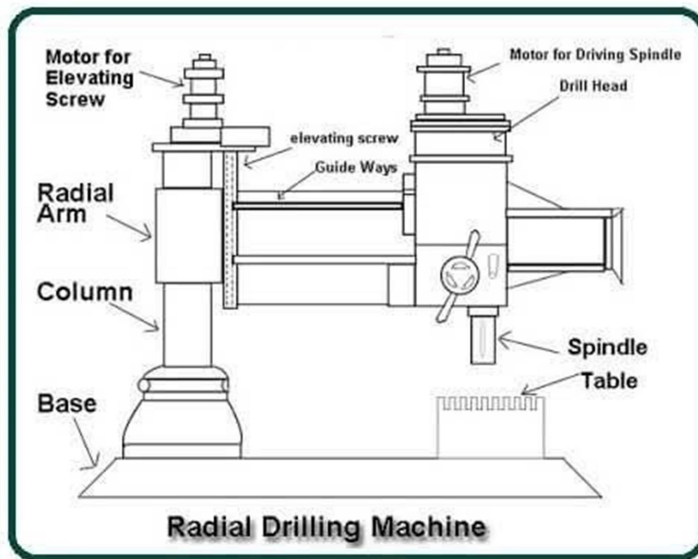
### 2.5.6 Shaping Machine



In the arsenal of mechanical machinery, the Shaping Machine stands out for its ability to shape and form metal workpieces with precision. Students engage with the Shaping Machine to understand the principles of metal shaping, honing their skills in creating components with specific geometries and dimensions.

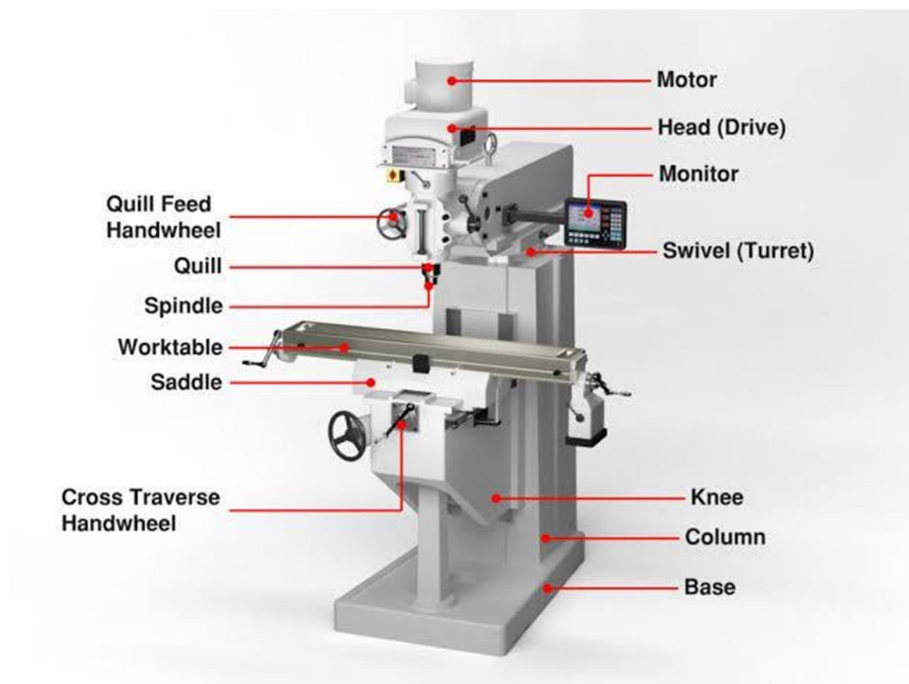


## 2.5.7 Drilling Machine



The Drilling Machine is a fundamental tool in metallurgical workshops, facilitating the creation of holes in metal workpieces. Students learn the intricacies of operating the Drilling Machine, mastering techniques such as hole positioning, depth control, and selecting appropriate drill bits for various materials.

## 2.5.8 Milling Machine



Milling Machines contribute to the versatility of metallurgical workshops, allowing students to perform precise milling operations on metal workpieces. From creating flat surfaces to intricate contours, students engage with the Milling Machine to develop skills essential for a range of metallurgical applications.

## **CHAPTER THREE**

### **WORKSHOP SAFETY**

#### **3.1 IMPORTANCE OF WORKSHOP SAFETY IN MECHANICAL ENGINEERING**

Workshop Safety is paramount in mechanical engineering, where hands-on activities involving heavy machinery, high temperatures, and potentially hazardous materials are commonplace. The importance of workshop safety cannot be overstated as it ensures the well-being of personnel, prevents accidents, and safeguards the integrity of the work environment.

In mechanical engineering, adherence to safety protocols is crucial for minimizing risks associated with the handling of metals, operation of machinery, and exposure to various processes. A commitment to workshop safety not only protects individuals but also contributes to the overall efficiency and productivity of operations.

#### **3.2 SAFETY PROTOCOLS IN WELDING AND FABRICATION**

Welding and fabrication involve intense heat, molten metals, and intricate machinery. Safety protocols in these areas encompass the proper use of personal protective equipment (PPE), such as welding helmets, gloves, and flame-resistant clothing. Additionally, workers are trained on fire prevention, proper handling of welding equipment, and maintaining a well-ventilated workspace to mitigate exposure to fumes.

Emphasis is placed on hazard identification and risk assessment, ensuring that potential dangers are recognized and addressed before initiating any welding or fabrication tasks. Regular equipment inspections, fire drills, and emergency response training further enhance the preparedness of individuals in the workshop.

#### **3.3 SAFETY PROTOCOLS IN BLACKSMITH AND FORGING**

Blacksmith and forging operations involve the shaping and manipulation of metals through heating and hammering processes. Safety measures in these operations include controlled heating procedures, proper handling of hot materials, and the use of safety gear like heat-resistant gloves and aprons.

Workers are trained to maintain a safe distance from hot surfaces and to handle tools with care to prevent accidents. Emergency procedures for handling burns or injuries are established, and fire extinguishers are strategically placed to address potential fire hazards.

### **3.4 HANDLING AND MAINTENANCE OF HYDRO LIFT OUT CRUCIBLE FURNACES**

Hydro lift out crucible furnaces are utilized in metallurgical processes for melting and casting metals. Safety in handling and maintaining these furnaces involves proper training on loading and unloading crucibles, monitoring temperature controls, and understanding emergency shutdown procedures.

Maintenance protocols include routine inspections to identify any wear and tear, ensuring that components are in good working condition. Workers are educated on the potential risks associated with furnace operations, emphasizing the importance of vigilance and adherence to safety guidelines.

### **3.5 SAFE PRACTICES WITH GAS WELDING MACHINES AND ARC WELDING MACHINE**

Gas welding machines and arc welding present unique safety challenges due to the use of open flames, high temperatures, and intense light. Workers are educated on the safe setup of gas welding equipment, proper storage and handling of cylinders, and the use of protective screens to shield against harmful UV radiation during arc welding.

Safe practices involve the correct positioning of welding equipment, ensuring proper ventilation to prevent the accumulation of fumes, and implementing lockout/tagout procedures to control energy sources during equipment maintenance. Regular training and awareness programs reinforce the importance of personal responsibility for safety in these operations.

## **CHAPTER FOUR**

### **PERSONAL INVOLVEMENT AND EXPERIENCES**

#### **4.1 EXPERIENCES IN WELDING AND FABRICATION**

My engagement in the Welding and Fabrication section during my SIWES program provided a rich learning experience in the art and science of metal joining. I immersed myself in theoretical concepts and practical applications, mastering various welding techniques such as gas welding, arc welding, and spot welding. The learning process involved understanding the properties of different metals, interpreting technical drawings, and developing proficiency in using welding equipment.

My practical application involved executing welding projects, ranging from basic joints to complex fabrications. Working with diverse materials, I honed my skills in creating strong and precise connections. This hands-on experience allowed me to translate theoretical knowledge into tangible outcomes, showcasing my ability to contribute to the creation of metal structures.

#### **4.2 EXPOSURE TO BLACKSMITH AND FORGING TECHNIQUES**

My hands-on experience involved working with heated metals, applying various forging techniques to create distinct shapes and forms. Through practical exercises, I gained proficiency in the art of forging, mastering skills in temperature control, hammering precision, and the selection of appropriate tools. This exposure broadened my understanding of metal shaping, linking traditional practices with contemporary metallurgical concepts.

#### **4.3 OPERATION AND MAINTENANCE OF HYDRO LIFT OUT CRUCIBLE FURNACES**

My involvement in the operation of Hydro Lift Out Crucible Furnaces delved into the core of metallurgical processes. I learned how to load and unload crucibles, monitor temperature controls, and execute safe operating procedures. This hands-on experience with specialized furnaces provided insights into the intricacies of metal melting and casting, highlighting the significance of precise temperature control and safety protocols.

In addition to operation, my experiences extended to the maintenance of Hydro Lift out Crucible Furnaces. I participated in routine inspections, ensuring that components were in optimal working condition. This aspect of my involvement underscored the importance of equipment maintenance in sustaining reliable and efficient metallurgical processes.

#### **4.4 HANDS-ON EXPERIENCE WITH SAND MIXER, GAS WELDING MACHINE, AND ARC WELDING**

##### **4.4.1 Experience with Sand Mixer:**

My hands-on experience with the Sand Mixer involved actively participating in the preparation of molds for casting. I engaged in the process of sand mixing, understanding the critical role it plays in ensuring the quality and integrity of castings. This practical exposure reinforced my theoretical knowledge, emphasizing the importance of proper sand preparation in metallurgical processes.

##### **4.4.2 Gas Welding Machine and Arc Welding:**

My practical involvement with Gas Welding Machines and Arc Welding Equipment contributed to the development of welding skills. Through hands-on exercises, you became adept at using these machines to join metals efficiently and precisely. The exposure to gas welding and arc welding techniques equipped you with valuable skills applicable to various metallurgical applications.

## **CHAPTER 5**

### **RECOMMENDATIONS AND CONCLUSION**

#### **5.1 RECOMMENDATIONS**

##### **5.1.1 Recommendations to the Place of Attachment**

- **Continuous Equipment Maintenance:**

It is recommended that the place of attachment prioritizes regular maintenance of the metallurgical equipment, especially the Hydro Lift out Crucible Furnaces, Sand Mixer, Gas Welding Machine, and Arc Welding Equipment. Implementing a proactive maintenance schedule ensures the longevity and optimal performance of these critical tools.

- **Expanded Practical Projects:**

Encouraging a diverse range of practical projects in the Welding and Fabrication Department and the Blacksmith and Forging Section can enhance the experiential learning of students. Expanding the scope of hands-on projects will provide students with exposure to a wider array of challenges, fostering creativity and innovation.

- **Integration of Emerging Technologies:**

Considering the rapid advancements in metallurgical engineering, integrating emerging technologies into the curriculum and workshops can keep students abreast of industry trends. Exploring technologies such as digital modeling, computer-aided design (CAD), and simulation tools can enrich the learning experience and prepare students for the evolving landscape of metallurgy.

##### **5.1.2 Recommendations to the Polytechnic**

- **Curriculum Enhancement:**

The polytechnic is encouraged to periodically review and enhance the metallurgical engineering curriculum to align with industry demands. Introducing new courses or modules that cover emerging trends and technologies in metallurgy will ensure that students receive a well-rounded and up-to-date education.

- **Industry Collaboration:**

Fostering closer ties with industries related to metallurgical engineering can provide valuable insights and opportunities for students. Collaborative efforts, such as internships, workshops, and guest lectures from industry professionals, can bridge the gap between academic knowledge and real-world applications.

- **Investment in Infrastructure:**

Continued investment in state-of-the-art infrastructure and equipment is crucial for maintaining the polytechnic's reputation as a center of excellence in metallurgical engineering education. Upgrading laboratories, acquiring the latest machinery, and ensuring a conducive learning environment contribute to the overall educational experience.

## **5.2 CONCLUSION**

In conclusion, the SIWES program at the Mechanical Engineering Department, Kwara State Polytechnic's mini-campus, has been a transformative experience. The exposure to welding and fabrication, blacksmithing, operation of specialized furnaces, and hands-on engagement with essential equipment has provided a holistic understanding of mechanical engineering.

The recommendations put forward aim to enhance the quality of education and practical training within the institution and the place of attachment. Continuous improvement in equipment maintenance, the introduction of innovative projects, integration of emerging technologies, and fostering collaboration with industries will contribute to the sustained excellence of the metallurgical engineering program.

This SIWES journey has not only equipped me with technical skills but has also instilled a deep appreciation for the intricacies of metallurgy. As I move forward in my academic and professional journey, the experiences gained during this program will undoubtedly shape my perspective and contribute to my success in the field of mechanical engineering.