

**A TECHNICAL REPORT ON STUDENT INDUSTRIAL WORK EXPERIENCE
SCHEME (S.I.W.E.S)**

COURSE CODE: SIWES 210

**CARRIED OUT AT
KENYON INTERNATIONAL WEST AFRICAN COMPANY LIMITED, RIVERS
STATE**

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DECLARATION

We sincerely declare that we are the sole writer of this report. The details of training and experience contained in this report describe my involvement as 4 months Student Industrial Work Experience Scheme (SIWES) interns at Kenyon international West African Company Limited. All the information contained in this report is certain and correct to us.

CERTIFICATION

It is certified that every content in this report is the original skill experienced at Kenyon International West African Company Limited and worthy of presentation in the Students' Industrial Work Experience (SIWES) Scheme.

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EXECUTIVE SUMMARY

The Student Industrial Work Experience Scheme (SIWES) is a program put in place by the Federal Government to ensure that all Science and Engineering Students in their undergraduate level obtain relevant industry experience by undergoing 4 months or 6-months internships in industries relevant to their course of study. We underwent my internship at Kenyon international west African company, an indigenous oil and gas servicing company with head office in Rivers state and operational base in Port Harcourt. The company utilizes a training plan which comprises of; Research and Development, Technical Presentation This Technical Report aims to explain in detail the relevant experiences acquired during my internship at Fortis Engineering and how they are related to my course of study. I highly recommend that the Student Industrial Work Experience Scheme (SIWES) be undergone twice by Engineering Students in the Institution to ensure that the students incorporate intensively the necessary skills and ability to work in the real world.

ACKNOWLEDGEMENTS

We express our sincere gratitude to God almighty, the Department of mechanical Engineering, Akwaibom State Polytechnic for the opportunity availed us in undergoing an intensive 4 months Student Industrial Work Experience Scheme (SIWES). We also wish to express our sincere gratitude to the Management and Staffs of Kenyon international West African Company Limited for the priceless work experience I acquired in the duration of my internship.

TABLE OF CONTENT

Title Page

Executive Summary.....	1
Acknowledgements.....	2
Table of Content.....	3
List of tables.....	5
List of Figures.....	5

Chapter 1

Introduction to Training program.....	1
1.1 Purpose of Training.....	6
1.2 Company's profile.....	7

Chapter 2

2.0 The Training Program.....	2
2.1 Pumps	4
2.2 Valves	6
2.3 Compressors	10

Chapter 3

Discussion, Analysis, Evaluation

3.0 Professional Knowledge Gained	21
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Chapter 4

Conclusion and Recommendation.....	22
Conclusion.....	22
4.0 Recommendation.....	24
4.1 Challenges encountered during training period.....	26
4.2 References.....	28

CHAPTER ONE

1.0 INTRODUCTION

1.1 INTRODUCTION TO THE SIWES TRAINING PROGRAM

1.1.1 OVERVIEW

The Student Industrial Work Experience Scheme (SIWES), also known as Industrial Training is a compulsory skills training programme designed to expose and prepare students of Nigerian Universities, Polytechnics, Colleges of Education, Colleges of Technology and Colleges of Agriculture, for the industrial work situation they're likely to meet after graduation. The scheme also affords students the opportunity of familiarizing and exposing themselves to the needed experience in handling equipment and machinery that are usually not available in their institution.

SIWES was established by ITF (Industrial Training Funds) in the year 1973 to solve the problem of lack of adequate proper skills for employment of tertiary institution graduates by Nigerian Industries. The Students' Industrial Work Experience Scheme (SIWES) was founded to be a skill training program to help expose and prepare students of universities, polytechnics and colleges of education for the industrial work situation to be met after graduation. This scheme serves as a smooth transition from the classroom to the world of work and further helps in the application of knowledge. The scheme provides students with the opportunity of acquainting and exposing themselves to the experience required in handling and managing of equipment and machinery that are usually not made available in their institutions.

1.1.2 OBJECTIVES OF SIWES

SIWES is a key factor required to inject and help keep alive industrialization and economic development in the nation through the introduction and practical teaching of scientific and technological skills to students. (Culled from Detailed Manual on SIWES Guidelines and Operations for Tertiary Institutions). Objectives of the Students Industrial Work Experience

Scheme include:

- (i) Provide an avenue for students to acquire industrial skills for experience during their course of study
- (ii) Expose students to work methods and techniques that may not be available during their course of study.
- (iii) Bridging the gap between theory and practice by providing a platform to apply knowledge learnt in school to real work situations
- (iv) Enabling the easier and smoother transition from school by equipping students with better contact for future work placement

1.2 ORGANIZATION HISTORY

Kenyon International West African Company Limited is an ISO 19001;2015 certified indigenous oil and gas servicing Company established in March 2018 with Head Office in Port Harcourt. The company is a fully owned Nigerian oil and gas servicing company. Their primary focus is to employ competent personnel and utilize specialized, technical expertise to positively contribute to the Nigerian Petroleum and Energy industry.

They seek to constantly deploy highly effective technologies through creative, customer-adapted solutions and their aim is to provide unrivalled problem-solving proficiencies within the industry.

1.2.1 MISSION STATEMENT

Innovative use of technologies to deliver client-focused value through the improvement of assets at all stages of its lifecycle.

1.2.2 VISION STATEMENT

To be recognized as the best-in-class Asset Integrity and Maintenance (AIM) Reliability Solutions in the Nigerian Oil & Gas Industry providing Engineering, Procurement, and Operations services with proactive regards to environment, health & safety while enhancing local capacity building in line with the Nigerian Content Development policy.

CHAPTER TWO

DETAILS OF WORK DONE DURING INDUSTRIAL TRAINING

2.1 THE TRAINING PROGRAM

It is mandatory for every new intern to undergo an intensive 5 agenda training plan that runs concurrently during their internship period at Kenyon International West African Company Limited. The training plan is in line with the major activities of the company and their key area of specialization, the aim of the training plan is to ensure that the interns fully understand the operations of oil and gas servicing companies in the country as well as to build capacity and ensure employability of the interns upon graduation. I was assigned to the Technical/Engineering Department and the training plan was streamlined to ensure relevance to my course of study. Below is a brief description of what we were taught.

2.2 PUMPS

Pumps in the oil and gas sector undergo comprehensive maintenance to ensure continuous and efficient fluid transport. Regular inspections check for wear, leaks, and alignment issues. Cleaning of components like impellers and seals prevents clogging and maintains performance. Lubrication of bearings and seals reduces friction and extends lifespan. Monitoring pump parameters such as pressure, flow rate, and temperature helps detect abnormalities early. Replacement of worn-out parts and timely repairs prevent costly breakdowns. Overall, meticulous pump maintenance is essential for uninterrupted operation, minimizing downtime, and optimizing productivity in oil and gas production and distribution processes.

2.2.1 Centrifugal Pump Maintenance

According to the maintenance supervisor, maintenance of centrifugal pumps is a critical aspect of ensuring uninterrupted operations in the oil and gas industry. Regular inspections are

conducted to detect any signs of wear or damage in components such as the impeller, casing, and seals. Any identified issues are documented and promptly addressed to prevent further damage and maintain optimal performance.

"The impeller, casing, and seals are thoroughly inspected during routine checks," said the supervisor. "We look for leaks, corrosion, or any abnormalities that could affect the pump's efficiency."

One of the key maintenance tasks for centrifugal pumps is the greasing of bearings as per the manufacturer's guidelines. This greasing process helps reduce friction and extends the lifespan of the bearings, thereby improving overall pump reliability. "We follow a strict greasing schedule to ensure the bearings are adequately lubricated," the supervisor added.

Additionally, alignment checks between the pump and motor are carried out regularly to ensure they are properly aligned, which is crucial for efficient pump operation. "Alignment is crucial for optimal performance. We use precision instruments to check and adjust the alignment as needed," explained the supervisor. During scheduled maintenance, the pump's performance is thoroughly tested using flow meters and pressure gauges. This testing helps identify any deviations from expected performance metrics and allows for adjustments to be made to optimize efficiency. "We use flow meters and pressure gauges to assess performance and make adjustments if necessary. This ensures the pump is operating at its best," stated the supervisor.

Overall, maintenance of centrifugal pumps involves a comprehensive approach that includes regular inspections, greasing of bearings, alignment checks, and performance testing to ensure reliable and efficient operation in the oil and gas industry.



Fig: Centrifugal Pump

2.2.2 Reciprocating Pump Maintenance

The maintenance engineer highlighted the importance of regular maintenance for reciprocating pumps, which are commonly used in high-pressure applications in the oil and gas sector. Key maintenance activities include inspecting valves, seals, piston rings, and packing glands to detect and address any wear or leaks. "We pay close attention to the valves, seals, and packing glands during maintenance checks. Any wear or leakage is promptly addressed to prevent operational issues," said the maintenance engineer. Valves and seals are replaced as needed to maintain efficient sealing and prevent fluid leaks. The condition of piston rings and packing glands is also monitored, with replacements carried out to ensure proper functionality and prevent downtime. "Lubrication is crucial for reciprocating pumps. We monitor and maintain oil levels according to manufacturer recommendations to reduce friction and extend component life," the engineer explained.

During maintenance intervals, the pump's lubrication system is thoroughly inspected, and oil levels are adjusted as necessary. This helps minimize wear on moving parts and ensures smooth

pump operation. Performance testing using pressure gauges and flow meters is another essential aspect of reciprocating pump maintenance. These tests help assess pump performance and identify any issues that may affect efficiency. "We conduct performance tests using pressure gauges and flow meters to check pump performance. Any deviations from expected readings prompt further investigation and adjustments," stated the engineer. Overall, maintenance of reciprocating pumps involves meticulous inspection, valve and seal replacements, lubrication management, and performance testing to ensure reliable operation in demanding oil and gas applications.



Fig: reciprocating pump

2.2.3 Gear Pump Maintenance

According to the maintenance team leader, gear pumps are valued for their ability to handle viscous fluids in oil and gas operations. Maintenance activities focus on inspecting gears, bearings, casings, and seals to ensure smooth and efficient pump performance.

"Regular inspections are conducted to check gears, bearings, and seals for wear or damage. Any issues are addressed promptly to prevent operational disruptions," said the team leader.

Gear and bearing replacements are carried out as needed to maintain optimal pump functionality and reduce the risk of breakdowns. Additionally, inspections of pump casings and seals help prevent fluid leaks and maintain a secure operating environment.

"Lubrication is vital for gear pumps. We adhere to a strict lubrication schedule to minimize friction and extend component life," the team leader emphasized.

During maintenance intervals, the lubrication system is thoroughly inspected, and oil levels are adjusted to ensure proper lubrication of moving parts. This helps enhance pump efficiency and longevity.

Performance testing using flow meters and pressure gauges is another essential maintenance activity for gear pumps. These tests help assess pump performance and identify any deviations from expected readings.

"We use flow meters and pressure gauges to test pump performance. This data allows us to make adjustments and optimize pump efficiency," explained the team leader.

In summary, gear pump maintenance involves comprehensive inspections, gear and bearing replacements, lubrication management, and performance testing to ensure reliable fluid handling in oil and gas applications.



Fig: Gear pump

2.2.4 Diaphragm Pump Maintenance

The maintenance supervisor highlighted the significance of maintenance for diaphragm pumps, which are widely used in handling corrosive and abrasive fluids in the oil and gas industry. Maintenance activities include inspecting diaphragms, valves, casings, and seals to detect and address any wear or leaks.

"Diaphragm pumps require careful maintenance due to the nature of fluids they handle. We inspect diaphragms, valves, and seals regularly to ensure integrity and prevent leaks," said the supervisor.

Diaphragms and valves are replaced as needed to maintain proper sealing and prevent fluid leakage. Additionally, inspections of pump casings and seals help ensure a secure operating environment and prevent corrosive damage.

"Lubrication plays a crucial role in diaphragm pump maintenance. We monitor and maintain oil levels to minimize wear and ensure smooth pump operation," the supervisor explained.

During maintenance intervals, the lubrication system is thoroughly inspected, and oil levels are adjusted to ensure adequate lubrication of moving parts. This helps extend component life and improve pump reliability.

Performance testing using pressure gauges and flow meters is another essential aspect of diaphragm pump maintenance. These tests help assess pump performance and identify any deviations from expected readings.

"We conduct performance tests using pressure gauges and flow meters to check pump efficiency. Any anomalies prompt further investigation and adjustments," stated the supervisor.

In conclusion, maintenance of diaphragm pumps involves meticulous inspections, valve and diaphragm replacements, lubrication management, and performance testing to ensure reliable fluid handling in challenging oil and gas environments.



Fig: Diaphragm pump

2.3 VALVES

Valves in the oil and gas industry are maintained through regular inspections for leaks, wear, and corrosion. Cleaning, lubrication, and part replacement ensure proper sealing and functionality. Testing under various conditions confirms reliability, contributing to safe and efficient fluid and gas flow within the systems.

2.3.1 Ball Valves:

John, a senior maintenance engineer, explains, "Ball valves are widely used in the oil and gas industry due to their reliability and versatility. Maintenance of ball valves primarily involves regular inspections and lubrication." He emphasizes the importance of checking for leaks and ensuring that the valve operates smoothly.

"During maintenance, we disassemble the valve to inspect the ball and seats for wear or damage," John continues. "We also clean and lubricate the components to prevent corrosion and ensure proper sealing." He mentions that in cases of severe wear, parts may need replacement, and reassembly is done following manufacturer guidelines to maintain optimal functionality.



Fig: Ball Valve

2.3.2 Gate Valves:

Sarah, a maintenance supervisor, discusses gate valves, stating, "Gate valves are crucial for isolating sections of pipelines in the oil and gas industry. Maintenance involves both preventive and corrective measures." She highlights the significance of regular inspections to detect issues early on.

"In maintenance routines, we check for leaks around the valve body and stem packing," Sarah explains. "We also inspect the gate for signs of erosion or corrosion, which can affect sealing." She notes that cleaning the valve internals and applying appropriate lubrication are key steps to ensure smooth operation.

"During corrective maintenance, we may need to replace damaged parts such as the gate, stem, or packing," Sarah adds. "Proper reassembly and testing are essential to verify the valve's integrity before putting it back into service."



Fig: Gate valve

2.3.3 Check Valves:

Michael, a valve technician, describes check valves, saying, "Check valves are critical for preventing backflow in pipelines, making their maintenance vital for uninterrupted operations." He stresses the need for periodic inspections to confirm the valve's functionality.

"In maintenance procedures, we examine the check valve's internals for debris buildup or wear," Michael states. "Cleaning is essential to ensure the valve opens and closes properly." He mentions that testing the valve under different flow conditions helps verify its performance.

"Replacement of worn-out components like the disc or spring is part of maintenance when necessary," Michael continues. "After reassembly, we conduct pressure and leakage tests to validate the check valve's effectiveness in preventing reverse flow."

In conclusion, maintenance of valves in the oil and gas industry is a systematic process that involves regular inspections, cleaning, lubrication, and, if needed, component replacement. Proper maintenance not only ensures operational efficiency but also enhances safety by minimizing the risk of leaks and failures in critical systems.



Fig: Check Valve

2.4 COMPRESSORS

Compressors in oil and gas undergo inspections, cleaning, lubrication, and alignment checks for optimal performance, efficiency, and longevity.

2.4.1 Reciprocating Compressors

According to John, a seasoned maintenance technician in the oil and gas industry, "Maintaining reciprocating compressors involves several crucial steps to ensure optimal performance and longevity." He elaborates on the process, starting with routine inspections.

"We begin by inspecting the piston rings, valves, and cylinders for wear and damage," John explains. "Cleaning and replacing worn-out components are essential to prevent leaks and maintain compression efficiency." He emphasizes the importance of checking and adjusting clearances to ensure proper sealing and minimize energy loss.

John also stresses the significance of lubrication in reciprocating compressors. "Using the correct lubricant and monitoring oil levels are critical," he notes. "Regular oil analysis helps assess component conditions and ensures smooth compressor operation."

Additionally, John highlights the need for periodic vibration analysis and alignment checks. "Detecting and addressing vibration issues early can prevent equipment failures and extend the compressor's lifespan," he concludes.



Fig: Reciprocating Compressor

2.4.2 Centrifugal Compressors:

Sarah, a maintenance supervisor with expertise in centrifugal compressors, shares insights into their maintenance procedures. "Maintaining centrifugal compressors requires a systematic approach to uphold efficiency and reliability," she states. She outlines the key maintenance tasks.

"We regularly inspect and clean the impeller, diffuser, and inlet guide vanes," Sarah explains. "Cleaning these components and maintaining proper clearances are crucial for optimal performance." She emphasizes the importance of balancing the impeller to reduce vibration and minimize stress on bearings.

Sarah also discusses auxiliary system maintenance, such as lubrication and cooling. "Monitoring oil levels, changing filters, and ensuring proper cooling water flow are vital for protecting compressor components," she says. "Maintaining these systems prevents overheating and extends equipment life."

Furthermore, Sarah highlights the role of condition monitoring in centrifugal compressor maintenance. "Using techniques like vibration analysis helps detect potential issues early," she adds. "Addressing these issues promptly minimizes downtime and avoids costly repairs."



Fig: Centrifugal compressor

2.4.3 Screw Compressors

Michael, a compressor technician specializing in screw compressors, details the maintenance practices for this type of equipment. "Maintaining screw compressors is essential for their reliability and performance," he asserts. He explains the key steps involved in maintenance.

"We inspect the rotors, bearings, and seals regularly for wear and damage," Michael explains. "Cleaning the compressor internals and ensuring proper lubrication are critical tasks." He notes the importance of monitoring oil and coolant levels, changing filters, and maintaining proper belt tension in belt-driven configurations.

Michael also emphasizes the role of regular alignment checks. "Proper alignment prevents excessive wear on components and extends equipment life," he says. "Addressing any issues promptly during maintenance ensures smooth compressor operation."



Fig: Screw Compressor

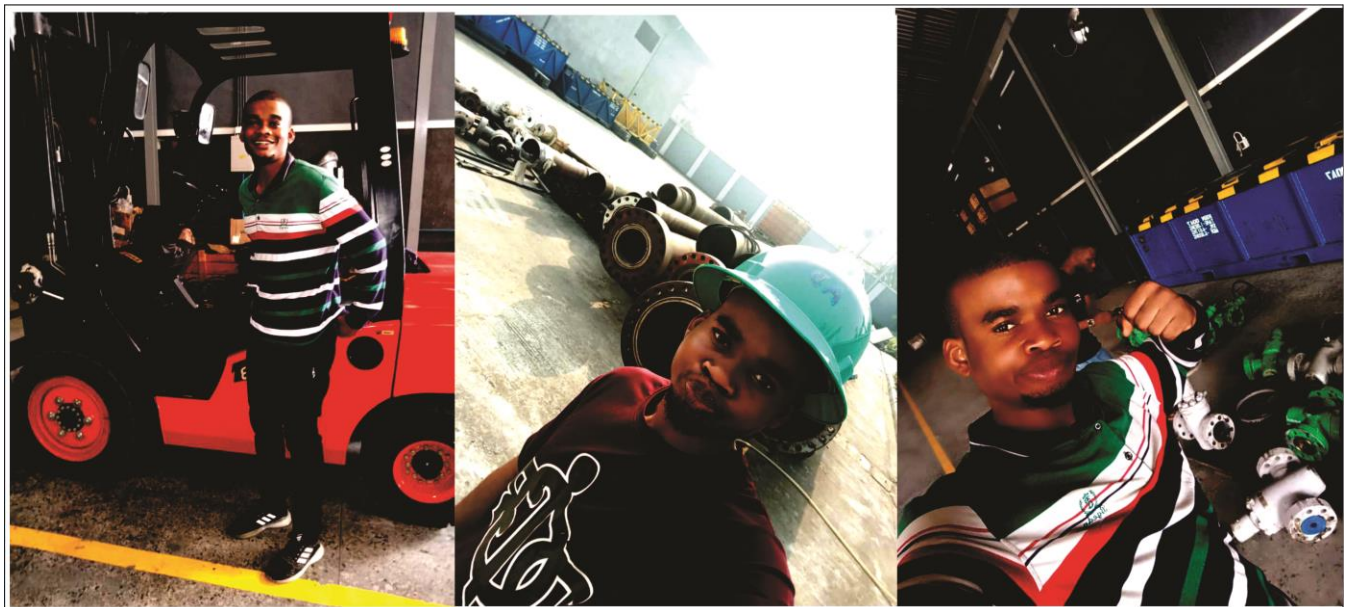


Fig: Pictorial work experience

CHAPTER THREE DISCUSSION, ANALYSIS AND EVALUATION

3.1 PROFESSIONAL KNOWLEDGE AND COMPETENCE GAINED

This technical report presents insights into the professional knowledge and competence gained through carrying out maintenance on compressors, valves, and pumps in the oil and gas industry. The experiences detailed herein encompass years of hands-on work and continuous learning in maintaining critical equipment essential for oil and gas operations.

(i) Compressor Maintenance

Maintenance of compressors has provided a deep understanding of their intricate workings and the significance of optimal performance. Through systematic inspections, diagnostics, and repairs, I have gained proficiency in identifying and addressing issues such as worn seals, lubrication inefficiencies, and misalignments. This experience has honed my troubleshooting skills and ability to pre-emptively resolve potential problems, contributing to improved equipment reliability and reduced downtime.

(ii) Valve Maintenance

Valve maintenance has been a cornerstone of ensuring precise fluid and gas flow control within oil and gas systems. The meticulous attention to detail required in detecting and rectifying leaks, optimizing sealing mechanisms, and conducting performance assessments has augmented my expertise in valve operation and maintenance. This knowledge is crucial for maintaining operational efficiency and safety across various processes.

(iii) Pump Maintenance

Pumps are vital components in the oil and gas industry, and their upkeep is paramount for uninterrupted operations. Through comprehensive maintenance routines encompassing regular inspections, performance monitoring, and timely repairs, I have gained a comprehensive

understanding of pump dynamics. This includes optimizing flow rates, pressures, and addressing wear-and-tear issues to maximize equipment lifespan and efficiency.

(iv) Collaborative Approach and Safety Focus

A collaborative approach within maintenance teams has underscored the importance of effective communication, knowledge sharing, and coordinated efforts. This collaborative environment has facilitated learning from peers' experiences, expanding my technical knowledge and problem-solving capabilities.

Furthermore, a strong emphasis on safety protocols and adherence to industry standards has been ingrained in maintenance practices. Prioritizing safety in all maintenance activities has not only ensured a secure working environment but also enhanced operational reliability by minimizing risks and incidents.

(v) Adaptability and Continuous Learning

Encountering diverse challenges in maintenance tasks has necessitated adaptability and resourcefulness in finding effective solutions. Embracing new technologies, tools, and methodologies, such as predictive maintenance software and advanced diagnostics, has been instrumental in optimizing maintenance processes and enhancing equipment performance.

The professional knowledge and competence gained through maintenance of compressors, valves, and pumps in the oil and gas industry represent a continuous journey of learning, problem-solving, and skill enhancement. These experiences have not only strengthened technical proficiency but also fostered a commitment to operational excellence, safety, and efficiency in oil and gas operations.

CHAPTER FOUR

CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

4.1 CONCLUSION

The SIWES program is a very good initiative by the Federal Government aimed at bridging the gap between academic learning and industrial experience. This was fully achieved in my 4 months internship training at Kenyon International West African Company Limited, while it had its shortcomings, we were able to gain vital experience relevant to my course of study. Over the duration of the internship, we gained experience on the operations of oil and gas servicing companies which includes but are not limited to, Equipment Maintenance. In addition, the internship program has greatly influenced my oral and written communication skills through exposure to numerous opportunities in technical report writing as well as presentations

4.2 LIMITATIONS

While my internship role does not avail me access to numerous tools and equipment because most of the equipment are deployed on sites that we did not have sufficient clearance to be present in those environments (COMPEX, OSP, BOSIET etc.,). We had some difficulties in navigating the operations of some of the equipment like the SNI smartPIMS, ATEX rated pneumatic grinding machine and PAUT system due to their complexities, functionalities and being required to be operated by specialized/skilled operators. However, after sufficient in-house demonstrations between my supervisor and the interns on the operation of these tools, we were able to easily navigate my way through.

4.2 RECOMMENDATIONS

- (i) As securing internship placement is becoming difficult each year, we recommend that the institution/department recommend students for internship opportunities in organizations related to their course of study.
- (ii) The institution and Department should liaise closely with the industries relating to the study of the program to breach the gap between academic learnings and real-life applications by organizing short internships, workshops and seminars on the operations of the industry.
- (iii) Research and Development is the bedrock on which ground breaking innovations and technologies are built upon, we suggest that students be fully engaged in the ongoing researches at the department/faculty level so as to help them obtain the skillset upon graduation.
- (iv) The Industrial Training Fund should provide adequate and prompt means of funding to students during the period of internship to ensure that the work experience is financially free.

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