NAVOI STATE UNIVERSITY

Department of Environmental Protection & Industrial Safety
in collaboration with Navoi Mining and Metallurgy Combinat (NMMC / NKMK)

15-DAY INTENSIVE PRACTICAL SYLLABUS: "MINI ENERGY AUDIT IN INDUSTRIAL PRODUCTION FACILITIES"

Course Title: Mini Energy Audit Practicum for Workshop Managers & Engineers
Target Audience: NMMC Technical Workshop Managers, Senior Engineers & Energy Auditors
Duration & Format: 15 Days (60 Total Hours) — Interactive Lectures, Field Practicum & On-Site Audits
Primary Objective: To equip technical leadership with diagnostic tools and methodology to identify energy losses, evaluate machinery efficiency, and produce actionable mini audit reports for NMMC production units.

1. Key Learning Outcomes & Target Competencies

- Master portable diagnostic equipment (infrared thermometers, power quality analyzers, ultrasonic leak detectors).
- Conduct load profiling and efficiency analysis on high-consumption electrical motors, compressors, and furnaces.
- Perform thermographic imaging to identify thermal leakage in steam pipelines and industrial building structures.
- Compile standardized Mini Energy Audit reports containing cost-benefit calculations and actionable saving strategies.

2. 15-Day Detailed Training Schedule & Module Breakdown

Day	Module Title	Topics & Practical Activities	Hours / Location
Day 1	**Introduction to Industrial Energy Auditing**	Fundamentals of energy audit standards (ISO 50021). National legal framework, energy efficiency targets for NMMC.	4 Hours NSU Hall
Day 2	**Diagnostic Instrumentation Training**	Hands-on calibration and use of portable meters, thermal imagers, ultrasonic leak detectors, and power analyzers.	4 Hours NSU Lab
Day 3	**Industrial Electrical Systems & Motors**	Load profiling for high-voltage motors and transformers. Calculating motor loading factor and power factor penalties.	4 Hours Lecture/Lab
Day 4	**Compressed Air Systems & Pneumatics**	Compressor efficiency dynamics. Methods for identifying air pressure drops, system leaks, and load/no-load optimization.	4 Hours Classroom
Day 5	**Thermal Energy & Steam Pipelines**	Boiler efficiency, steam trap operation, thermal insulation standards, and measuring heat dissipation in pipelines.	4 Hours Lecture/Lab
Day 6	**HVAC, Ventilation & Lighting Systems**	Industrial ventilation power draw, variable frequency drives (VFDs), and transition to high-efficiency LED industrial lighting.	4 Hours Classroom
Day 7	**Audit Methodology & Baseline Creation**	Collecting historical consumption data, building energy baselines, and establishing Energy Performance Indicators (EnPIs).	4 Hours Classroom

Day	Module Title	Topics & Practical Activities	Hours / Location
Day 8	**Field Orientation & Safety Prep**	Pre-audit site logistics at NMMC workshop. Safety protocols, PPE requirements, and baseline measurement plan setup.	4 Hours NMMC Facility
Day 9	**Field Audit: Electrical & Motor Drive Units**	On-site audit of active high-voltage motors, pumps, and welding stations at NMMC workshop. Recording real-time power metrics.	4 Hours NMMC Workshop
Day 10	**Field Audit: Compressor & Pneumatic Systems**	Conducting ultrasonic leak detection on compressed air lines and testing compressor load cycles in workshop units.	4 Hours NMMC Workshop
Day 11	**Field Audit: Thermal Loss & Insulation**	Thermographic survey of furnaces, drying units, and steam pipes using thermal cameras to identify insulation flaws.	4 Hours NMMC Workshop
Day 12	**Data Consolidation & Calculations**	Aggregating field measurements, quantifying annual power/thermal losses, and calculating baseline energy waste.	4 Hours NSU Lab
Day 13	**Cost-Benefit Analysis & Action Plan**	Formulating energy saving measures (ESMs), estimating simple payback periods (SPP), ROI, and implementation costs.	4 Hours Classroom
Day 14	**Drafting the Mini Audit Report**	Structuring the standardized audit report, preparing data visualizations, energy balance charts, and executive summaries.	4 Hours Lab / Workshop

Day	Module Title	Topics & Practical Activities	Hours / Location
Day 15	**Report Presentation & Defense**	Presentation of Mini Energy Audit reports to NMMC Efficiency Committee and NSU expert board. Certification delivery.	4 Hours NSU / NMMC

3. Mini Energy Audit Final Report Template Structure

On Day 14–15, each participating engineer/manager completes and defends a standardized report containing:

- **Executive Summary:** Overview of evaluated equipment, total energy baseline, and potential savings.
- **Equipment Inventory & Metrics:** Operating hours, rated capacity, and measured active/reactive power draw.
- **Energy Loss Analysis:** Thermographic images, ultrasonic leak counts, and identified operational inefficiencies.
- **Actionable Recommendations:** List of low-cost and medium-cost energy conservation measures (ECMs).
- **Financial Feasibility:** Capital expenditure requirements, annual monetary savings, and payback period (years).