National Association of Metallurgical and Materials Engineering Students (NAMMES NIGERIA)

OFFICE OF THE PUBLIC RELATIONS OFFICER

MONTHLY WEBINAR

v. 1.0

Hello Metals..!

Topic:

BEYOND THE FURNACE

Redefining Global Impact Through Metallurgical & Materials Engineering

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National Society of Black Engineers' President

What we must have discussed…

- Who you are and how to Identify your global relevance as an MME student
- MME's role in modern industries: tech, aerospace, biomedical, energy
- Early academic and research engagement (start from year one, reach out to professionals)
- Building an online portfolio and research presence (LinkedIn, Google Scholar, GitHub, etc). You never could tell who's watching or who will reach out to you or when you will need it as reference, to show how long you've been actively involved in the field. Digital is Gold!
- Strategic skill sets and certifications (e.g., Python, corrosion analysis, materials simulation)
- Merging core metallurgy with AI, nanotech, and data science
- The power of academic writing and publishing before graduation
- Industry vs. academia: how to prepare for both paths
- Leveraging global trends like green materials, 3D printing, and bioengineering
- How to think beyond metallurgy into product development and entrepreneurship
- The art of global networking —LinkedIn, conferences, mentors - From undergrad to graduate research: scholarship and assistantship opportunities abroad
- Telling your professional story: blogging, social impact, project portfolios
- Major global industries driven by MME (renewables, aerospace, biomedical, defense)
- Internships, online courses, and certifications that matter
- How to be seen as a thought leader through your digital presence
- Becoming research-ready: tools, tools, tools (e.g., MATLAB, COMSOL, ANSYS)

About Me…

- I’m a passionate advocate for innovation, leadership, and global impact through science and technology. I earned my undergraduate degree in **Metallurgical and Materials Engineering**, where I served as the departmental president and led several student centered initiatives aimed at research, development, and community engagement.
- **Master’s degree in Computer Science at Western Illinois University**, where I also serve as the President of the **National Society of Black Engineers (NSBE).**

My research intersects biomedical technology and cybersecurity, particularly focusing on the safety of implantable medical devices, bridging materials science with cutting edge computer engineering.

Beyond academics, I am an entrepreneur and founder of Banjnet Digital, a tech driven initiative aimed at digital transformation and youth empowerment. My journey is deeply rooted in creating solutions, mentoring aspiring professionals, and redefining how engineering, especially Metallurgical and Materials Engineering, can be a powerful tool for entrepreneurship, leadership, and sustainable development in today’s global landscape.

What is Metallurgical & Materials Engineering?

Metallurgical and Materials Engineering (MME) focuses on the discovery, development, processing, and testing of materials used to create nearly every product in modern society. These materials include metals, ceramics, polymers, composites, and semiconductors.

Key Focus Areas:

- Extraction: How raw materials like ores are mined and purified
- Processing: Shaping, treating, and modifying materials to get desired properties (e.g., heat treatment, forging, rolling)
- Structure-Property Relationships: Understanding how internal structure (grains, atoms, defects) affects performance.
- Design & Application: Choosing the right material for specific uses (e.g., corrosion-resistant alloys for marine use, lightweight composites for aerospace, biocompatible alloys for medical implants)

Figure 1. MME Focus (AI Generated Image)

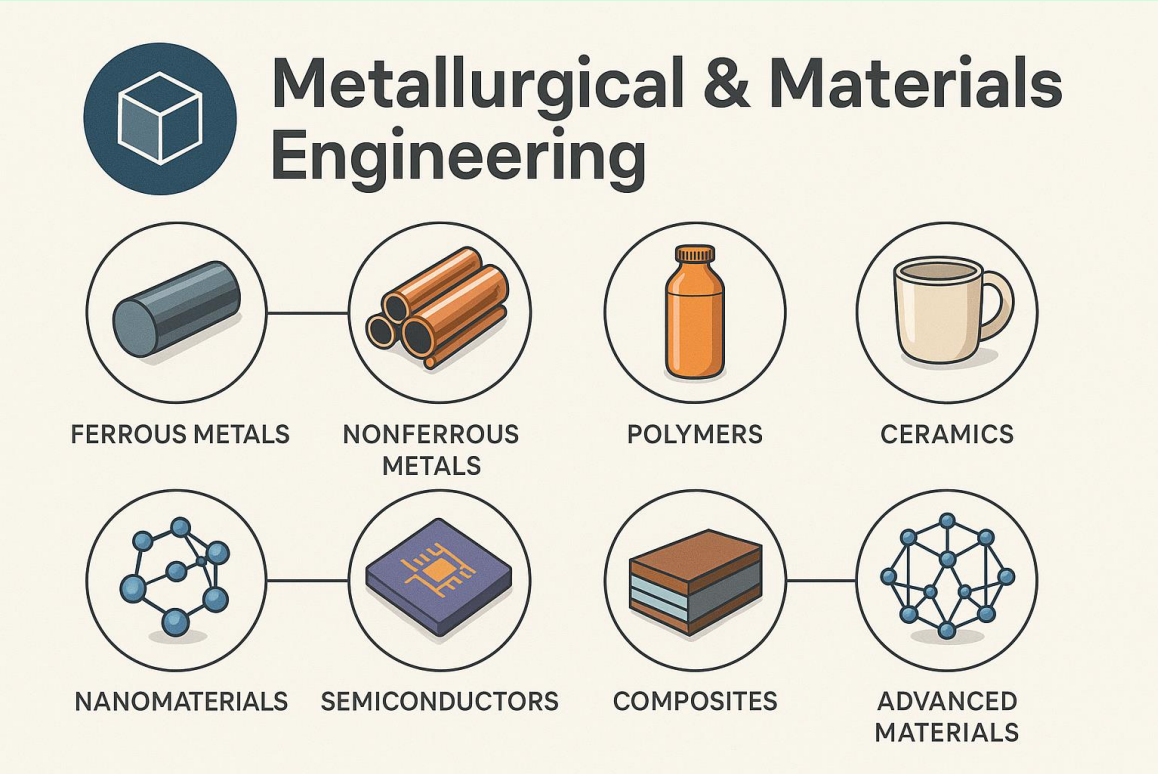

Figure 2. MME Popular Focus (**AI Generated Image)**

What's your interest?

Identifying that on time, could help you define what exactly you are doing in any field/industry.

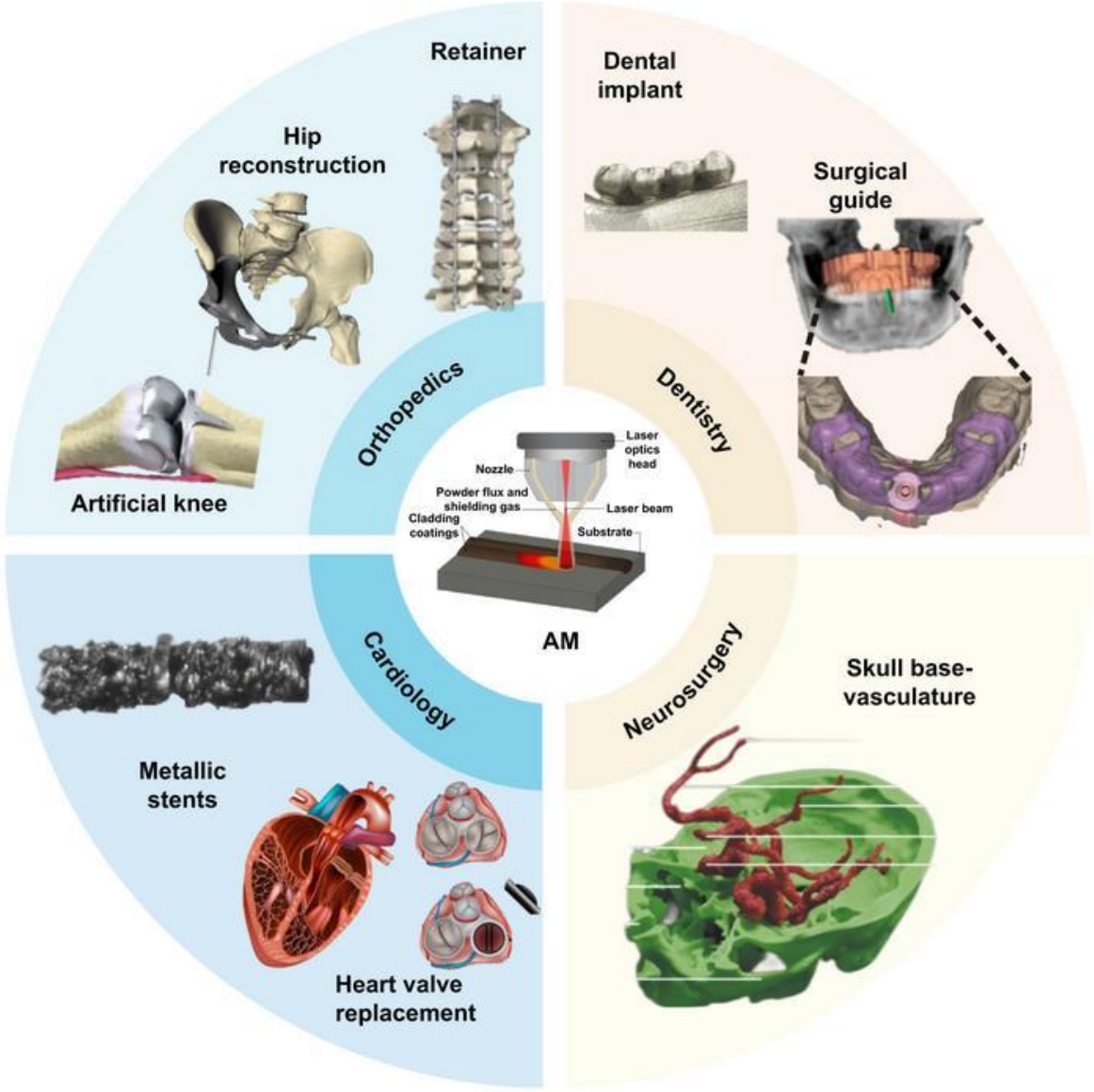

Figure 3. **Medical Metal Implants [3]**

Why Metallurgy Matters to the World

Metallurgy - backbone of innovation across industries.

From Artificial Intelligence hardware (like GPUs and processors) to robotic joints, everything relies on carefully engineered materials.

Fields like:

- Biomedical Engineering need corrosion-resistant, biocompatible materials (e.g., titanium for implants).
- Aerospace Engineering demands lightweight superalloys and high-temperature composites.
- Energy (e.g., wind turbines, solar panels, nuclear reactors) depends on specialized materials for longevity and performance.
- Even Data Science and Quantum Computing use superconducting materials and engineered substrates.

Figure 4. Why MME Matters (AI Generated Image)

Webinar Focus:

Repositioning MME Engineers for Global Opportunities

CATEGORIES OF STUDENTS/GRADUATES:

- How you can thrive and position yourself as a leader, while still in Nigeria. Either as a student, a graduate, a consultant, a research analyst or an active researcher.
- Or, how you can be ahead of your peers, acquiring the right skills, gaining some experiences before leaving school, working on the right projects from 100 level, how to network and engage with industry experts and finally, document all of that!

BENEFITS

- Networking
- Being exposed
- Endless Opportunities
- Scholarships

- Graduate Assistantship (for those Interested in studying abroad)
- Even if you intend to travel to USA with Green Card **(EB2Niw)**
- Exposures…

1st Category Pathway (Either as an individual or a collective)

UNDERSTAND LOCAL CHALLENGES IN NIGERIA (2025)

- Underdeveloped Manufacturing & Processing Sector
- Poor Infrastructure (Many foundries and rolling mills operate below capacity or have shut down, Inconsistent power supply)
- Neglect of Local Research & Innovation
- Skill-Industry Mismatch
- Import Dependence
- Environmental and Sustainability Concerns (Improper waste management in metal recycling and foundries)

WHAT TO DO

- Start Early! (You've got to be excited and interested!)
- Identify your interest and be very decisive! (Though change is the constant thing in life but it will all align) - Research
- Don't wait for opportunities, create yours! (Eg. summer internship training) – For leaders, departmental presidents, etc
- Internships, Early experience (how to go about it?)
- Publish Papers
- Join associations, not just MME related (that's where relevance begin!)
- Connect with global researchers

PRACTICAL AND PROACTIVE STEPS TO TAKE (2025)

1. Skill Up with Practical & Digital Tools

- Learn CAD, ANSYS, SolidWorks, or ABAQUS for materials simulation and design.
  - Learn material characterization tools like SEM, XRD, DSC (even virtually).
  - Join platforms like Coursera, edX, or Udemy for courses on welding, metallurgy, corrosion, etc.

2. Research & Small-Scale Innovation

- Conduct student-led R&D on:
- Local alloy development (e.g., aluminum from bauxite)
- Biodegradable materials from local resources (e.g., cassava waste)
- Low-cost building materials (e.g., clay composites, rice husk ash cement)
- Apply for local/international competitions like IFIA, YALI, or NACGRAB.

3. Internships & Apprenticeships

Seek experience in: Steel companies (e.g., Ajaokuta Steel, Premium Steel, Dana Steel), Cement and ceramic industries, Oil & gas servicing companies (for corrosion/metallurgy roles), Metal fabrication SMEs

4. Entrepreneurship in Recycling or Additive Manufacturing

Start a small venture in:
- 3D printing services using plastic or metal filaments
- Composite material production from agricultural waste.

PRACTICAL AND PROACTIVE STEPS TO TAKE (2025)

5. Community-Based Projects
Organize or join engineering projects focused on:

- Rural clean water systems (corrosion-resistant pipes)
- Low-cost housing (materials engineering focus)
- Repair of agricultural tools (welding/metallurgy skills)

6. Build an Online Portfolio

7. Policy & Advocacy Involvement
Participate in engineering societies (e.g., **NSE**, **NIMMME**, **MSN**).
Advocate for industrial investment in metallurgy.
Work on awareness campaigns for sustainable material usage.

EXAMPLES OF PROJECTS TO WORK ON (ASK AI TOOLS)

- Sustainable alloys for roofing
- Local corrosion inhibitors
- Recyclable packaging solutions

2nd Category Pathway (Global visibility and Migration)

UNDERSTAND GLOBAL CHALLENGES (2025)

1. Sustainable and Green Materials

Challenge: Reduce environmental impact of materials (e.g., metals, plastics, composites).

Global Need: Eco-friendly materials, recyclable alloys, biodegradable polymers.

2. Lightweight & High-Performance Materials

Challenge: Develop materials that are strong, light, and resistant to harsh conditions.

Global Need: Used in aerospace, automotive, defense, and space industries.

3. Advanced Manufacturing (e.g., Additive Manufacturing)

Challenge: Integrate 3D printing and digital tools into production.

Global Need: Faster, decentralized manufacturing of complex components.

4. Corrosion & Materials Degradation

Challenge: Combat losses due to material degradation, especially in oil & gas, marine, and infrastructure.

Global Need: Develop corrosion-resistant coatings and alloys.

5. Materials for Energy

Challenge: Create materials for batteries, solar cells, hydrogen storage, etc.

Global Need: Support clean energy transition.

6. Circular Economy & Recycling

Challenge: Manage materials sustainably from cradle to grave.

Global Need: Smart recycling of metals, plastics, and composites

MINI PROJECT IDEAS FOR NIGERIAN STUDENTS (GLOBALLY ALIGNED AND LOCALLY FEASIBLE)

Energy Materials Projects

- Development of Local Clay-Based Thermal Insulators

- Apply in rural cookstoves or cold storage.

- Solar Cell Enhancement Using Local Materials

- Test dye-sensitized solar cells using natural dyes (e.g., hibiscus, pawpaw leaf extract).

- Battery Electrode from Coconut Husk or Palm Kernel Waste

- Study activation and performance of carbonized biomass.

2nd Category Pathway (Global visibility and Migration)

MINI PROJECT IDEAS FOR NIGERIAN STUDENTS (GLOBALLY ALIGNED AND LOCALLY FEASIBLE)

Sustainable Materials & Recycling

- Production of Composite Bricks Using Plastic Waste + Sand or Laterite

- Lightweight, durable bricks for affordable housing.

- Recycling Aluminum Scrap into Cooking Utensils or Machined Parts

- Set up a mini foundry using locally fabricated equipment.

- Bio-Plastic Production from Cassava or Corn Starch

- Test degradation rate, tensile strength, and practical uses.

Advanced Manufacturing

- Low-Cost 3D Printer Using Recycled Plastic Filaments

- Collect PET bottles, convert to filament, print simple parts.

- Casting and Machining of Engine Parts Using Sand Mold and Aluminum Scrap

- Learn casting, solidification, and finishing basics.

Corrosion and Surface Engineering

- Corrosion Inhibition Study Using Local Plant Extracts (e.g., bitter leaf, neem)

- Test on mild steel in saline water.

- Design of Protective Coating Using Coconut Oil or Epoxy + Metal Fillers

- Test durability in acidic or marine environments.

Materials Testing & Characterization

- Tensile and Hardness Tests on Bamboo-Reinforced Polymer

- Simple mechanical testing using school lab or improvised setup.

- Thermal Conductivity of Local Ceramic Tiles vs Imported Tiles

- Use DIY apparatus and compare insulation performance.

2nd Category Pathway (Global visibility and Migration)

HOW TO BE INVOLVED

- Get involved globally (digitally, conferences, seminars, engage and network)
- School Purpose (Embassy interviews, Graduate Assistantship Purposes, Scholarships, Experience as a focused individual, easy to talk about self
- Grants/competitions
- Startup funds
- Research Analyst (Remote jobs)
- Publish Articles or Papers online for digital presence (LinkedIn, Research Gates & others..) – don't just do projects, try to publish them online (some get sponsored
- Research about the right organizations to join (depending on your area of interest, for example: biodegradable engineering
- Connect with global researchers
- Tools: Google Scholar, GitHub, LinkedIn
- EB2Niw

EXAMPLES OF PROJECTS (ASK AI FOR MORE)

- Biocompatible materials for implants
- AI for material simulation
- Green alloys for 3D printing
- Nanocomposites for aerospace
- And more….

Available Professions for Metallurgical/Materials Engineers in Nigeria

🏭 1. Manufacturing & Processing

- Metallurgical Engineer – in steel, aluminum, or copper production companies.
- Foundry Technician – casting and heat treatment roles.
- Materials Inspector/Quality Control Officer – testing materials to meet standards (SON, ISO).
- Process Engineer – optimization of material transformation in cement, glass, or ceramic industries.

🛠️ 2. Oil & Gas and Energy

- Corrosion Engineer – design and maintenance of anti-corrosion systems.
- Materials Selection Specialist – choosing the right alloys for pipelines, refineries, etc.
- Welding/Inspection Engineer – especially in upstream (offshore rigs) and midstream operations.

🧪 3. Research & Development

- Research Assistant – in universities, RMRDC (Raw Materials Research and Development Council), NASENI.
- Lab Technologist – operating materials testing equipment (XRD, SEM, etc.).
- Academic Pathway – lecturing in polytechnics or universities.

🔄 4. Recycling and Waste Management

- Recycling Operations Engineer – in small- and medium-scale plastic or metal recycling firms.
- Sustainable Materials Consultant – promoting green product design and waste-to-wealth innovations.

⚙️ 5. Construction and Civil Infrastructure

- Materials Testing Engineer – analyzing concrete, steel, and composite materials for building.
- QA/QC Engineer – ensuring compliance of construction materials.

👷 6. Public Sector and Regulation

- Standardization Officer – at SON (Standards Organisation of Nigeria).
- Mining Officer – in Ministry of Mines and Steel Development.

💡 7. Entrepreneurship

- Foundry/Metal Works Business Owner
- Recycled Product Developer – converting waste to consumer goods.
- 3D Printing Business – making tools, prototypes, or parts from plastic/metal.

Global Career Opportunities (USA, UK, EU, Canada, etc.)

🧪 1. Research & Advanced Materials Development

- Materials Scientist/Engineer
- Nanomaterials Researcher
- Polymer Scientist
- Biomaterials Engineer – especially in the medical device or prosthetics industry.
- Employers: National Labs, MIT, Oxford, BASF, 3M, NASA.

🚀 2. Aerospace and Defense

- Aerospace Materials Engineer
- Thermal Coatings Specialist
- Fatigue/Fracture Analyst
- Employers: Boeing, Lockheed Martin, Rolls Royce, Airbus.

🔋 3. Renewable Energy & Electronics

- Battery Materials Engineer – lithium-ion, solid-state, etc.
- Photovoltaic Materials Developer
- Semiconductor Process Engineer
- Employers: Tesla, Intel, Samsung, Siemens, SunPower.

🏭 4. Advanced Manufacturing & Industry 4.0

- Additive Manufacturing Engineer (3D Printing)
- Metallurgist – in powder metallurgy, welding, metal forming.
- Process Control Engineer – integrating AI/ML with material processes.
- Employers: GE, Honeywell, HP, BMW.

🛡️ 5. Corrosion, Coatings & Surface Engineering

- Corrosion Engineer – especially for oil & gas, marine, or nuclear plants.
- Protective Coatings Specialist
- Employers: Shell, BP, Schlumberger, TotalEnergies, Bechtel.

🧬 6. Biomedical and Healthcare Materials

- Medical Materials Engineer – artificial joints, implants, drug delivery.
- Tissue Engineering Researcher
- Employers: Medtronic, Johnson & Johnson, NHS Trusts (UK), academic hospitals.

🌐 7. Consulting & Cross-Disciplinary Roles

- Failure Analysis Consultant
- Materials Sustainability Analyst
- Patent/Technical Consultant – for materials-based innovations.

Advanced Application of Metallurgy with Other fields/industry

Field	Advanced Materials Applications	Example Roles
Biomedical	Implants, drug delivery, scaffolds	Biomedical Materials Engineer
Nanotech	CNTs, graphene, MOFs, nanocomposites	Nanomaterials Researcher
AI + Materials	Predictive modeling, alloy design, microstructure analysis	Materials Informatics Engineer
Energy	Batteries, solar cells, hydrogen materials	Energy Storage Scientist
Aerospace/Nuclear	Superalloys, composites, radiation-resistant coatings	Aerospace Materials Engineer
Photonics	Plasmonics, photonic crystals, optoelectronic materials	Photonic Devices Engineer
Environmental	Recyclable materials, geopolymers, green composites	Sustainability Materials Specialist
Smart Materials	Shape-memory alloys, piezoelectrics, EAPs	Smart Systems Developer

- **Build experience from your curiosity**
- **"You don’t know until you try.“**

- Start early: Don't wait till final year
- Publish & showcase your work
- Build a strong digital presence
- Choose your niche by experimenting
- Network, Collaborate, Stay consistent

- MME is a passport to the future
- You can innovate from Nigeria or from abroad
- Excellence has no zip code
- Believe in your ideas, invest in yourself

Let’s connect: www.linkedin.com/in/damiadebanjo

Thank You!