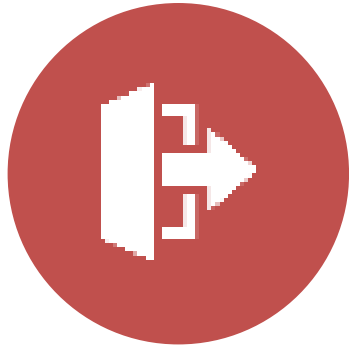


GET101: ENGINEERS IN SOCIETY



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UNIT 1 OVERVIEW: Engineering and Engineers

- What is Engineering?
- Who is an Engineer?
- Classical Branches of Engineering
- Specialized Fields Today
- Historical Development of Technology
- Early Civilizations (Egypt, Greece, Rome, Arabs)



Engineering and Engineers

- **What is Engineering?**
- Application of science to solve human problems
- Designing tools, machines, and systems
- Goal-oriented and practical

Engineering is the practical use of science. It's about recognizing problems, finding solutions, and building systems that improve human life. From bridges to smartphones, engineering is everywhere.



Who is an Engineer?

- Bridge between scientist and craftsman
- Understands theory and practice
- Harnesses nature for human benefit

An engineer connects theory with practice. Palmer described engineers as mediators between scientists and craftsmen. Tedgold said engineers harness the forces of nature for mankind.

Classical Branches of Engineering

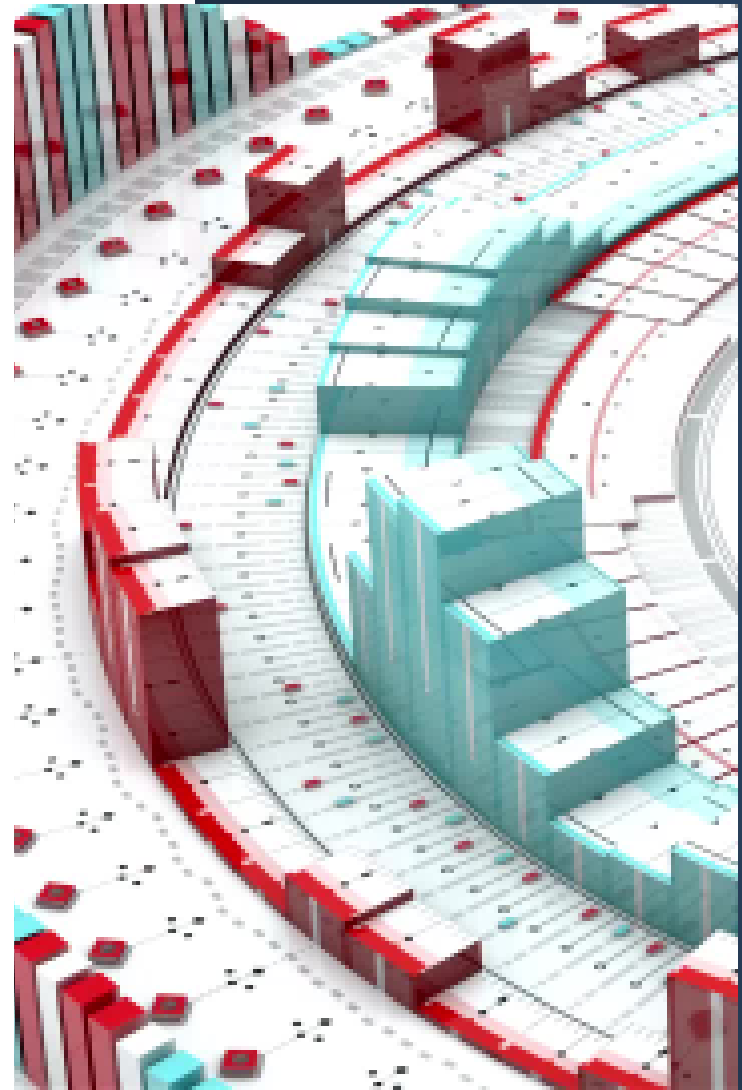
- Civil: roads, bridges, buildings
- Mechanical: machines, engines, manufacturing
- Metallurgical/Materials: mining, petroleum, refining
- Chemical: industrial processes, fuels
- Electrical: power, electronics, communication

By the 17th–18th centuries, engineering split into five main branches. Civil engineers build infrastructure, mechanical engineers design machines, metallurgical engineers refine materials, chemical engineers handle processes, and electrical engineers focus on power.

Specialized Fields Today

- Biomedical, Nuclear, Agricultural, Environmental
- Systems & Computer Engineering
- Marine, Textile, Ceramic, Food Engineering

Engineering has expanded far beyond the classical branches. Today, fields like biomedical engineering improve healthcare, while environmental engineers protect ecosystems. Computer engineers design modern technologies.



Historical Development of Technology

- Engineers transform knowledge into tools
- Techniques evolve with time
- Growth in science drives engineering progress

From ancient times, engineers have converted knowledge into practical tools. As science grew, engineering methods changed too. Engineers must always adapt to new discoveries.

Early Civilizations



Egyptians: pyramids, irrigation, surveying



Greeks: shipbuilding, navigation, screw pump



Romans: aqueducts, roads, arches, water mills



Arabs: water clocks, camera obscura, irrigation systems



Civilizations advanced through engineering. Egyptians built pyramids, Greeks developed navigation, Romans created aqueducts and roads, and Arabs contributed in optics and irrigation.

UNIT 2 OVERVIEW:History of Modern Technology

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Concept of
Modern
Technology



Developmen
t of Modern
Civilization



Industrial
Revolution



Impact in
Europe



Lessons for
Nigeria



Summary

History of Modern Technology

Concept of Modern Technology

- Technology = applied knowledge
- Modern = industrial + scientific revolution
- Continuous innovation

Modern technology grew rapidly during the industrial and scientific revolutions and continues to evolve today.

Development of Modern Civilization



Shift from agriculture to industry



Rise of machines and factories



Urbanization



Civilization transformed as machines replaced manual labor. Factories grew, cities expanded, and economies shifted.

Industrial Revolution

- Steam engines, mechanized production
- Railways and transport systems
- Mass production
- **Speaker's Notes:** The Industrial Revolution introduced steam engines, mechanized production, and railways. It marked the beginning of modern industry.

Impact in Europe

- Economic growth
- Social changes
- Scientific progress

Europe experienced rapid economic growth, social changes like urban migration, and scientific progress.

Lessons for Nigeria

- Importance of innovation
- Need for industrialization
- Adaptation to local context

Nigeria can learn from Europe's industrialization by fostering innovation, building industries, and adapting technology.

Summary

- Modern technology = driver of progress
- Industrial Revolution = turning point
- Nigeria must embrace innovation

Modern technology drives progress. The Industrial Revolution was a turning point. For Nigeria, embracing innovation is essential.

UNIT 3 OVERVIEW: Technological Advancements

- Pervasive Nature of Technology
- Role of Materials
- Power and Fuels
- Transportation Sector
- Electronics Revolution
- Summary

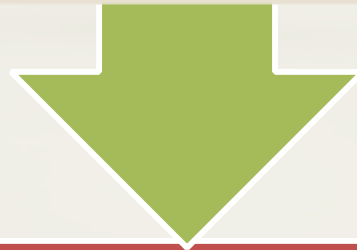
Technological Advancements

Pervasive Nature of Technology

Technology
affects all
sectors

Continuous
improvement

Global impact



Technology is everywhere; from agriculture to medicine. It constantly improves and impacts societies worldwide.



Role of Materials

- Steel, plastics, composites
- Foundation of industry
- Enables innovation

Materials like steel and plastics form the backbone of industry. They enable innovation in construction, transport, and electronics.



Power and Fuels

- Petroleum, coal, renewable energy
- Energy drives industry
- Transition to clean energy

Energy sources like petroleum and coal powered industries. Today, renewable energy is vital for sustainability.

Transportation Sector



- Automobiles, railways, aviation
- Improved mobility
- Global trade

Transportation advancements improved mobility and enabled global trade. Cars, trains, and planes connect the world.

Electronics Revolution



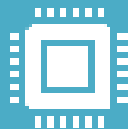
Computers,
semiconductors



Communication
systems



Digital age



Electronics revolutionized
communication and computing.
Semiconductors and computers
ushered in the digital age.

Summary



- Materials, energy, transport, electronics
- Core drivers of progress
- Engineers at the center

Technological advancements in materials, energy, transport, and electronics drive progress. Engineers are at the center.

UNIT 4 OVERVIEW: Technological Development in Nigeria

- Indigenous Technology (Pre-Colonial)
- Colonial Era
- Post-Colonial Industrialization (1960–1980)
- Policies (Biotech, Space, IT)
- Achievements & Challenges
- Summary

Indigenous Technology (Pre-Colonial)

- Iron smelting and blacksmithing
- Weaving, pottery, and leather works
- Agricultural tools and irrigation systems
- Community-based innovations

Before colonial rule, Nigerians developed indigenous technologies to meet local needs. Iron smelting produced tools and weapons, weaving and pottery supported daily life, and irrigation systems improved farming. These technologies were community-driven and reflected creativity with available resources.

Colonial Era

- Introduction of foreign technology
- Railways, roads, and administrative systems
- Focus on resource extraction
- Dependence on imported expertise

During colonial times, foreign technologies were introduced: railways, roads, and administrative systems. However, these were designed mainly to extract resources for export. Local innovation was sidelined, and Nigeria became dependent on imported expertise and machinery.

Post-Colonial Industrialization (1960–1980)

- Heavy industries: steel plants, refineries
- Manufacturing initiatives
- Ambitious national projects
- Limited long-term success

After independence, Nigeria invested heavily in industrialization. Projects like steel plants and refineries were launched to drive self-sufficiency. While ambitious, many struggled due to poor planning, corruption, and lack of technical expertise, limiting their long-term success.

Policies (1980s–Present)

- Biotechnology development
- Space research initiatives (e.g., satellites)
- Information technology policies
- Lagos Plan of Action & PCST

From the 1980s onward, Nigeria introduced policies to strengthen technology. Biotechnology, space research (including satellite launches), and IT became priorities. The Lagos Plan of Action and the Presidential Council on Science and Technology aimed to guide national innovation.

Achievements & Challenges

- Achievements: satellite launches, IT hubs, local innovations
- Challenges: reliance on foreign expertise, weak infrastructure
- Policy implementation gaps
- Need for stronger R&D culture

Nigeria has achieved notable successes, such as launching satellites and developing IT hubs. However, challenges remain: dependence on foreign expertise, weak infrastructure, and poor policy implementation. Building a stronger research and development culture is essential.

Summary

- Indigenous roots of Nigerian technology
- Colonial influence shaped development
- Post-colonial industrialization efforts
- Policies driving modern innovation
- Achievements balanced by challenges

Nigeria's technological journey reflects indigenous creativity, colonial influence, and post-colonial industrialization. Modern policies aim to drive innovation, but achievements are balanced by persistent challenges. The future depends on strengthening local expertise and sustainable development.

UNIT 5 OVERVIEW: Technical Education System in Nigeria

Technical Education System in Nigeria

Main Features of National Policy on Technical Education

Structure of Technical Education in Nigeria

Curriculum of Vocational & Technical Education

Roles in the Engineering Team

Present Training Arrangements in Nigeria

Critical Appraisal of Current Systems

National Board for Technical Education (NBTE)

Conclusion

Technical Education System in Nigeria



Backbone of Nigeria's industrial and technological growth



Provides skilled manpower for engineering and vocational sectors



Combines theory with practical training



Supports national development goals

Main Features of National Policy on Technical Education



Emphasis on **practical and vocational skills**



Development of **skilled manpower** for industry and technology



Integration of technical education into **national development plans**



Promotion of **self-reliance** and reduction of dependence on foreign expertise



Focus on **quality assurance and accreditation**

Structure of Technical Education in Nigeria



Vocational/Craft (VEIs/Craft schools): Artisans/craftsmen; trade certificates



Technical colleges: Craft and junior technicians; NTC/NBC; Advanced Craft



Polytechnics/Monotechnics: ND (technician) → HND (technologist)



Universities: B.Eng/B.Tech (engineer); advanced theory/design/research

Curriculum of Vocational & Technical Education

- Designed to meet industry and national manpower needs
- Combines theory with practical training
- Covers engineering trades, applied sciences, and business studies
- Promotes **problem-solving, creativity, and innovation**
- Aligns with **accreditation standards** set by NBTE and other bodies

Roles of Craftsmen, Technicians, Technologists, and Engineers in the Engineering Team

Engineer → Designs, plans, and leads complex technical projects

Technologist → Applies engineering principles to practical systems and operations

Technician → Maintains, tests, and operates equipment and machinery

Craftsman → Performs skilled manual tasks in trades like welding, carpentry, and electrical work

The Engineer

Designs and plans complex systems and infrastructure

Leads technical teams and manages engineering projects

Applies scientific and mathematical principles to solve problems

Engages in research, innovation, and development

Requires university-level education (B.Eng/B.Tech)

The Technologi st

Applies engineering principles to
practical systems and operations

Bridges the gap between **engineers'**
designs and technicians' execution

Focuses on **implementation,**
supervision, and applied problem-
solving

Typically trained at **polytechnics/**
monotechnics (HND level)

Ensures efficiency, safety, and
reliability in industrial processes

The Technician

Specializes in **operation, testing, and maintenance** of equipment

Executes engineers' and technologists' instructions in practical settings

Provides **technical support** in industries like manufacturing, construction, and energy

Trained at technical colleges and polytechnics (ND level)

Ensures systems run smoothly and safely

The Craftsman

- Performs **skilled manual tasks** in trades (welding, carpentry, plumbing, electrical work)
- Provides the **hands-on foundation** of industrial and technical projects
- Works under supervision of technicians, technologists, and engineers
- Trained at **vocational institutions/ craft schools**
- Awards include **trade certificates** and advanced craft qualifications

Present Training Arrangement s in Universities

- Universities focus on **engineering degree programs (B.Eng/B.Tech)**
- Emphasis on **theoretical knowledge** with limited practical exposure
- Training includes **lectures, labs, and industrial attachments (SIWES)**
- Graduates expected to become **professional engineers** after registration with COREN
- Challenges: **insufficient equipment, overcrowding, and limited industry collaboration**

A Critical Look at the Current Systems



Universities → Strong in theory, weak in practical training



Polytechnics → Strong in applied skills, limited in research and innovation



Overlap & duplication → Similar courses offered at different levels



Industry disconnect → Weak collaboration between institutions and industries



Resource challenges → Inadequate facilities, outdated equipment, and overcrowded classrooms

Universities

Offer Bachelor of Engineering (B.Eng) / Bachelor of Technology (B.Tech) programs

Emphasis on theoretical knowledge, design, and research

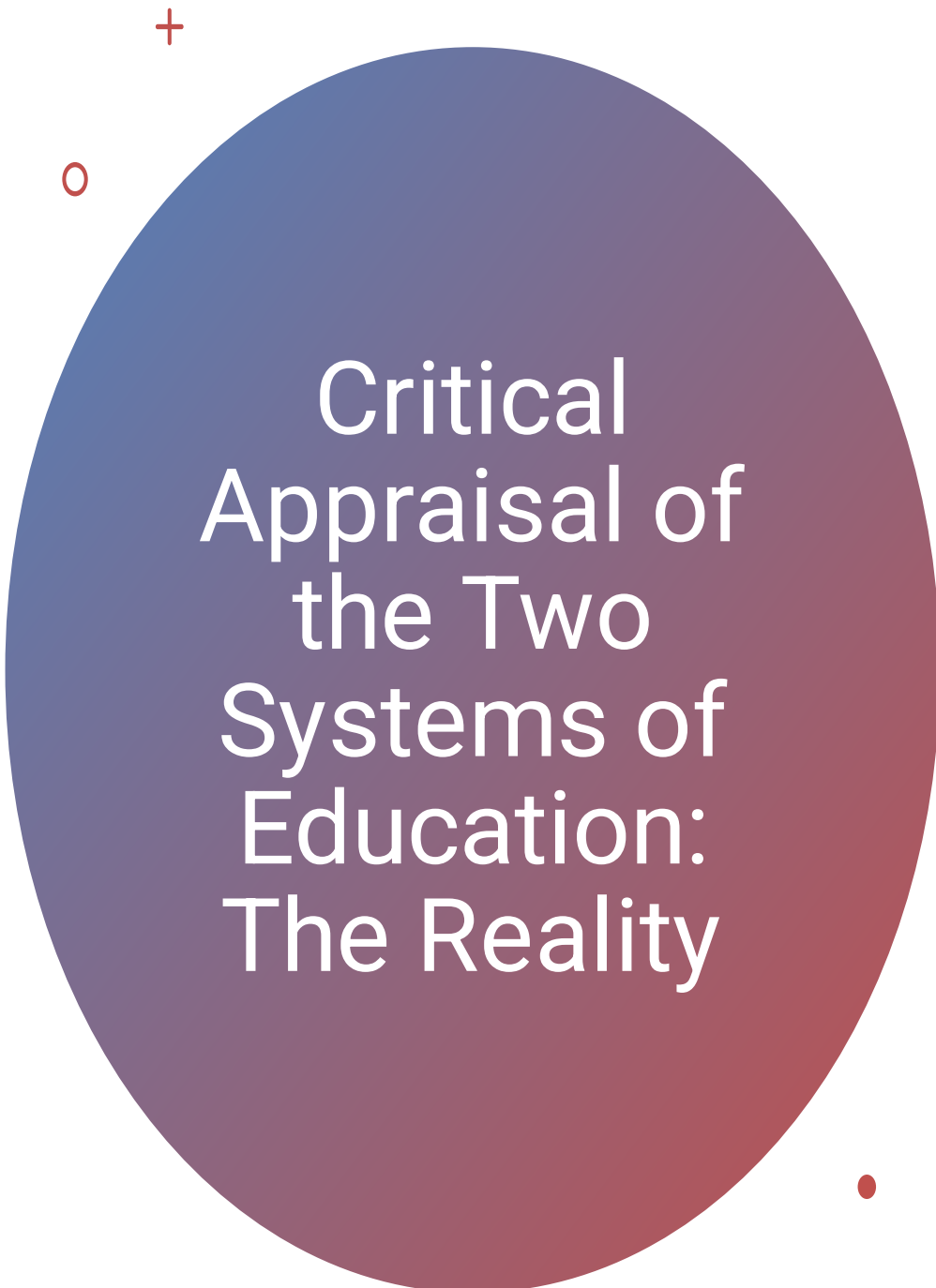
Provide laboratory work and industrial training (SIWES)

Graduates qualify for professional registration with COREN

Challenges: limited practical exposure, inadequate facilities, and weak industry linkages

The Polytechnic S

- Offer National Diploma (ND) and Higher National Diploma (HND) programs
- Focus on applied skills, practical training, and industry readiness
- Strong emphasis on laboratory work, workshops, and hands-on projects
- Produce technicians (ND) and technologists (HND)
- Challenges: limited research capacity, lower recognition compared to universities, and resource constraints



Critical Appraisal of the Two Systems of Education: The Reality

•Universities

- Strength: strong in theory, design, and research
- Weakness: limited practical exposure, inadequate industry collaboration

•Polytechnics

- Strength: strong in applied skills, hands-on training, industry readiness
- Weakness: limited research capacity, lower recognition compared to universities

•Reality Check

- Both systems face **resource challenges** (equipment, facilities, overcrowding)
- Duplication of programs → confusion in manpower classification
- Weak industry linkages → mismatch between training and labor market needs

National Board for Technical Education (NBTE)

Established to regulate and oversee technical education in Nigeria

Supervises polytechnics, monotechnics, and technical colleges

Ensures standardization of curricula and accreditation of programs

Provides guidelines for manpower development in technical fields

Acts as a bridge between institutions, government, and industry

Functions of the Board (NBTE)

Accreditation → Approves and accredits technical and vocational programs

Curriculum Development → Designs and updates curricula to meet industry needs

Quality Assurance → Ensures standards in teaching, facilities, and assessment

Manpower Planning → Provides guidelines for producing skilled technical workforce

Coordination → Links institutions, government, and industry for effective collaboration

Policy Implementation → Oversees execution of national technical education policies

Summary



Nigeria's technical education system is structured into **craft schools, technical colleges, polytechnics, and universities**



Each level produces different categories of manpower: **craftsmen, technicians, technologists, and engineers**



Curriculum combines **theory and practical training** to meet industry needs



Universities → strong in theory & research; Polytechnics → strong in applied skills



Both systems face challenges: **resource constraints, duplication, weak industry linkages**



NBTE plays a key role in **regulation, accreditation, and curriculum development**

UNIT 6

OVERVIEW:

Engineer's Roles and Responsibilities

Work of the Engineer

Maintenance & Fabrication

Research & Development

Engineers in Management

Other Functions (Teaching, Consulting,
Public Service)

Nation Building

Work of the Engineer

Designs and develops systems, structures, and technologies

Applies scientific and mathematical principles to solve real-world problems

Ensures safety, efficiency, and sustainability in engineering solutions

Works across sectors: civil, mechanical, electrical, chemical, software, etc.

Contributes to innovation and national development

Maintenance & Fabrication

Engineers ensure equipment and systems function reliably and efficiently

Perform routine maintenance, troubleshooting, and repairs

Involved in fabrication of components, tools, and prototypes

Use technical drawings, specifications, and precision instruments

Critical for safety, productivity, and cost-effectiveness in industries

Research & Development (R&D)

Engineers drive innovation and technological advancement

Conduct experiments, simulations, and feasibility studies

Develop new products, processes, and materials

Improve efficiency, safety, and sustainability of existing systems

Collaborate with universities, industries, and research institutes

Engineers in Management

Take on	Take on leadership and administrative responsibilities in organizations
Manage	Manage projects, budgets, and resources effectively
Supervise	Supervise technical teams and coordinate multidisciplinary work
Apply	Apply problem-solving and analytical skills to decision-making
Contribute	Contribute to policy formulation and strategic planning

Other Functions of Engineers

- **Teaching** → Train future engineers and technicians in universities, polytechnics, and technical colleges
- **Consulting** → Provide expert advice to industries, governments, and organizations
- **Public Service** → Contribute to policy-making, infrastructure planning, and national projects
- **Professional Associations** → Participate in COREN, NSE, and other engineering bodies
- Extend influence beyond technical work into **education, governance, and advisory roles**

Nation Building

- Engineers play a **strategic role in national development**
- Provide **infrastructure**: roads, bridges, power plants, water systems, ICT networks
- Support **industrial growth** through manufacturing, energy, and technology
- Contribute to **sustainable development** and environmental protection
- Enhance **quality of life** by solving societal challenges
- Act as **drivers of innovation, productivity, and economic progress**

Summary

Engineers perform diverse roles beyond technical design and problem-solving

Core Work → Designing, developing, and applying scientific principles

Maintenance & Fabrication → Ensuring reliability of systems and creating components/prototypes

Research & Development → Driving innovation, efficiency, and sustainability

Management → Leading projects, supervising teams, and strategic decision-making

Other Functions → Teaching, consulting, public service, and professional associations

Nation Building → Providing infrastructure, supporting industry, and improving quality of life

UNIT 7

OVERVIEW:

The Engineerin g Family

Members of the Family

Nigerian Society of Engineers
(NSE)

COREN Regulation

Membership Categories

Other Associations (NATE,
NAEC)

Summary

Members of the Engineering Family

- **Craftsmen** → Skilled in manual and technical tasks
- **Technicians** → Operate, maintain, and troubleshoot equipment
- **Technologists** → Apply engineering principles in practical settings
- **Engineers** → Design, analyze, and innovate systems and structures
- Each member plays a **distinct role** in national development

“The engineering family includes craftsmen, technicians, technologists, and engineers. Each group contributes uniquely to the technical workforce. Craftsmen are skilled in hands-on tasks, technicians handle equipment and maintenance, technologists bridge theory and practice, and engineers focus on design and innovation. Together, they form a complete ecosystem for industrial and national growth.”

Nigerian Society of Engineers (NSE)

- Founded to **promote professionalism and ethics** in engineering
- Organizes **conferences, training, and networking events**
- Advocates for **engineering policies and national development**
- Membership includes **students, graduates, corporate members, and fellows**
- ♦ **Speaker Notes**
- “The NSE is the umbrella body for engineers in Nigeria. It promotes professionalism, ethics, and continuous development. Through conferences and training, it keeps members updated on industry trends. NSE also advocates for policies that support engineering and national progress.”

COREN Regulation

- Council for the Regulation of Engineering in Nigeria (COREN)
- Regulates engineering practice and ensures standards
- Accredits engineering programs in universities and polytechnics
- Registers engineers, technologists, technicians, and craftsmen
- Enforces **compliance with professional ethics and codes**
- ♦ **Speaker Notes**
- “COREN is the regulatory body for engineering in Nigeria. It ensures that engineering practice meets national standards. COREN accredits academic programs and registers professionals across all levels. It also enforces ethical conduct and protects public interest.”

- **Graduate Member** → Recent engineering graduates
- **Corporate Member** → Practicing engineers with COREN registration
- **Fellow** → Senior professionals with distinguished contributions
- **Honorary Member** → Recognized non-engineers with impact on the profession
- Membership reflects **experience, qualifications, and contributions**
- “Engineering bodies like NSE and COREN classify members based on qualifications and experience. Graduate members are new entrants, corporate members are practicing professionals, fellows are senior experts, and honorary members are non-engineers who’ve made notable contributions. These categories help maintain standards and recognize excellence.”

Membershi p Categories

60

Other Associations (NATE, NAEC)

- **NATE** → Nigerian Association of Technologists in Engineering
- **NAEC** → Nigerian Association of Engineering Craftsmen
- Represent **technologists and craftsmen** respectively
- Advocate for **training, recognition, and career development**
- Complement NSE and COREN in building a **unified engineering profession**
- ♦ **Speaker Notes**
- “Beyond NSE and COREN, other associations like NATE and NAEC represent technologists and craftsmen. They advocate for training, recognition, and career advancement for their members. These groups ensure that every segment of the engineering family is supported and valued.”

Summary of Unit 7 – The Engineering Family

- Engineering family includes **craftsmen, technicians, technologists, and engineers**
- NSE promotes **professionalism and ethics**
- COREN regulates **practice and standards**
- Membership categories reflect **career stages and contributions**
- NATE and NAEC support **technologists and craftsmen**
- Together, they ensure a **cohesive and effective engineering workforce**
- ♦ **Speaker Notes**
- “To wrap up Unit 7, the engineering profession in Nigeria is structured as a family. Each member — from craftsmen to engineers — plays a vital role. NSE promotes professionalism, COREN regulates standards, and associations like NATE and NAEC support specialized groups. This structure ensures unity, development, and excellence across the profession.”

UNIT 8 OVERVIEW: Regulation of Practice

COREN Functions

Engineers' Code of Ethics

Accreditation of Programs

Industrial Training (SITSIE)

Monitoring & Compliance
(ERM)

Summary

COREN Functions

- Regulates engineering practice across all levels
- Accredits engineering programs in institutions
- Registers engineers, technologists, technicians, and craftsmen
- Enforces compliance with professional standards and ethics
- Advises government on engineering-related policies
- **◆ Speaker Notes**
- “This slide outlines the key functions of COREN — the Council for the Regulation of Engineering in Nigeria. COREN ensures that engineering practice meets national standards by accrediting academic programs and registering qualified professionals. It also enforces ethical conduct and advises the government on engineering policies.”

Engineers' Code of Ethics

- Uphold integrity, honesty, and professionalism
- Prioritize public safety, health, and welfare
- Avoid conflicts of interest and unethical practices
- Maintain confidentiality and respect for clients/ employers
- Commit to continuous learning and competence
- ♦ **Speaker Notes**
- “This slide presents the Engineers' Code of Ethics. Engineers are expected to act with integrity, honesty, and professionalism. They must prioritize public safety and avoid conflicts of interest. Confidentiality and respect for clients are essential, and engineers must commit to lifelong learning to stay competent.”



Accreditation of Programs

- COREN accredits engineering programs in universities and polytechnics
- Ensures **curriculum relevance and quality**
- Verifies **availability of qualified staff and facilities**
- Promotes **uniform standards across institutions**
- Accreditation is essential for **professional recognition**
- ♦ **Speaker Notes**
- “Accreditation ensures that engineering programs meet national standards. COREN evaluates curriculum, staff qualifications, and facilities to maintain quality. Accredited programs produce graduates eligible for professional registration and recognition.”

Industrial Training (SITSIE)

- **Students Industrial Training Scheme for Industrial Experience (SITSIE)**
- Provides **practical exposure** to real-world engineering environments
- Bridges gap between **theory and practice**
- Enhances **employability and technical competence**
- Supervised by institutions and monitored by COREN
-  **Speaker Notes**
- “SITSIE is a vital part of engineering education. It gives students hands-on experience in real-world settings, helping them apply classroom knowledge to practical tasks. This enhances their technical skills and prepares them for the workforce. Institutions and COREN monitor the training to ensure quality.”

Monitoring & Compliance (ERM)

- **Engineering Regulation Monitoring (ERM) by COREN**
- **Ensures compliance with engineering standards and ethics**
- **Monitors projects, professionals, and institutions**
- **Investigates violations and enforces sanctions**
- **Promotes accountability and public trust**
- **◆ Speaker Notes**
- **“COREN uses Engineering Regulation Monitoring (ERM) to ensure compliance with standards and ethics. It monitors engineering projects and professionals, investigates violations, and enforces sanctions when necessary. ERM promotes accountability and builds public trust in the profession.”**

Summary of Unit 8

- COREN regulates engineering practice and advises government
- Engineers follow a strict **Code of Ethics**
- Accreditation ensures **quality and recognition** of academic programs
- SITSIE provides **practical training** for students
- ERM promotes **compliance, accountability, and public trust**
-  **Speaker Notes**
- “To conclude Unit 8, regulation of engineering practice is essential for professionalism and public safety. COREN plays a central role by accrediting programs, registering professionals, and monitoring compliance. Engineers follow a strict code of ethics, and students gain practical experience through SITSIE. ERM ensures that standards are upheld across the profession.”

UNIT 9 OVERVIEW: Technology Transfer

What is Technology Transfer?

Transfer Process

Nigeria's Readiness

Mechanisms of Transfer

Integration of Science &
Engineering

Summary

What is Technology Transfer?

- Movement of **knowledge, skills, and tools** from one entity to another
- Can occur between **countries, institutions, or industries**
- Involves **adoption, adaptation, and application** of technology
- Aims to **boost innovation, productivity, and development**
- Critical for **developing nations** to close technological gaps
-  **Speaker Notes**
- “Technology transfer is the process of moving knowledge, skills, and tools from one entity to another. It can happen between countries, institutions, or industries. The goal is to adopt and adapt technology to local needs, boosting innovation and development. For countries like Nigeria, it’s a vital strategy to bridge the technological divide.”

Transfer Process

- **Identification** of relevant technologies
- **Negotiation** of terms and agreements
- **Adaptation** to local conditions and infrastructure
- **Implementation** through training and deployment
- **Evaluation** of impact and sustainability
- ♦ **Speaker Notes**
- “The process of technology transfer involves several stages. First, relevant technologies are identified. Then, terms are negotiated — often involving licensing or partnerships. The technology is adapted to fit local conditions and infrastructure. Implementation includes training and deployment, followed by evaluation to ensure long-term impact.”

Nigeria's Readiness

- Has **skilled workforce** and **growing tech ecosystem**
- Faces challenges: **infrastructure gaps, funding, and policy alignment**
- Requires **strong institutions and regulatory frameworks**
- Needs **collaboration with global partners and private sector**
- Education and R&D are key to **absorbing and sustaining technology**
- ♦ **Speaker Notes**
- “Nigeria has a skilled workforce and a growing tech ecosystem, but challenges remain. Infrastructure gaps, limited funding, and weak policy alignment hinder progress. To be ready for technology transfer, Nigeria needs strong institutions, clear regulations, and global partnerships. Education and research are also essential for absorbing and sustaining new technologies.”

Mechanisms of Transfer

- **Licensing agreements and joint ventures**
- **Foreign direct investment (FDI)**
- **Technical training and capacity building**
- **Research collaborations and academic exchange**
- **Importation of equipment and software**
- **◆ Speaker Notes**
- “Technology can be transferred through various mechanisms. Licensing and joint ventures allow local firms to use foreign technologies. Foreign direct investment brings in capital and expertise. Training and academic exchange build local capacity. Research collaborations and equipment importation also play key roles in the transfer process.”

Integration of Science & Engineering

- Science provides **theoretical foundation and discovery**
- Engineering applies science to **solve practical problems**
- Integration leads to **innovation, product development, and industrial growth**
- Encourages **multidisciplinary collaboration**
- Essential for **effective technology transfer and national development**
- ♦ **Speaker Notes**
- “Science and engineering must work together for successful technology transfer. Science offers the theoretical foundation, while engineering applies it to solve real-world problems. Their integration drives innovation and industrial growth. Multidisciplinary collaboration is key to adapting and scaling technologies for national development.”

Summary of Unit 9

- Technology transfer is vital for innovation and development
- Involves **identification, adaptation, and implementation**
- Nigeria must strengthen **infrastructure, policy, and partnerships**
- Transfer mechanisms include **licensing, FDI, training, and collaboration**
- Integration of **science and engineering** is essential for success
- **◆ Speaker Notes**
- “To wrap up Unit 9, technology transfer is a key driver of innovation and development. It involves identifying, adapting, and implementing technologies. Nigeria must improve infrastructure, policies, and partnerships to benefit fully. Mechanisms like licensing, FDI, and training facilitate the process. Finally, integrating science and engineering ensures that transferred technologies are effectively used and sustained.”

UNIT 10

OVERVIEW:

Foundations of Engineering Competence

- What is Competence?
- Core Technical Skills
- Professional & Soft Skills
- Emerging Competence Areas
- Lifelong Learning
- Summary

UNIT 11

OVERVIEW: **Safety and Risk in Engineering**

- Importance of Safety
- Hazard Identification
- Risk Assessment Methods
- Safety Management Systems
- Human Factors & Case Studies
- Summary

UNIT 12

OVERVIEW:

Sustainable Development Goals (SDGs)

- Introduction to SDGs
- Key Goals (Poverty, Hunger, Health)
- Education and Equality
- Clean Water and Sanitation
- Engineers' Role in SDGs
- Conclusion: Path Forward