

Crafting a 21st Century Undergraduate Engineering Programme for Sub-Saharan Africa

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Ethical Leadership Innovative Thinking A New Africa

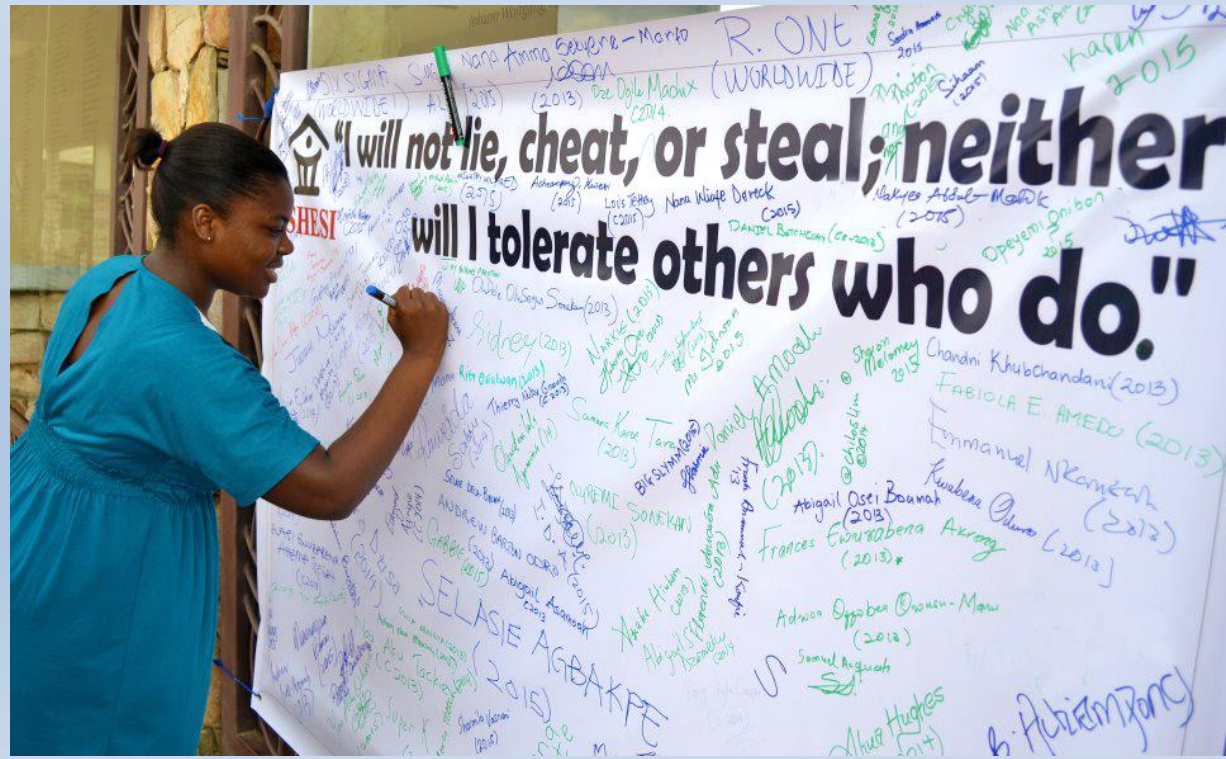
Africa Needs:

- Effective Teams
- Innovation
- Tenacious Leaders

PIONEERS OF THE
EXAMINATION HONOUR CODE
Started in January 2008

To educate a
new generation
of ethical,
entrepreneurial
leaders in
Africa.

To cultivate within
our students the
critical thinking
skills, the **concern**
for others, and the
courage it will take
to transform their
continent.





Academic Programmes

- Computer Science
 - Management Information Systems
- Business Administration
- Engineering
 - Computer
 - Electrical & Electronic
 - Mechanical



Liberal Arts Core: Social Sciences, Humanities, Mathematics, African Studies and Leadership



- John E. Fetzer Institute Funding - Spring 2014
 - Love, Compassion, Forgiveness
- Initial working document complete - Spring 2014
- Sent to local and international engineering educators - May 2014
 - Olin Summer Collaboratory – June 2014
- Presented to Industry Stakeholder's Meeting - August 2014



Development of Engineering Programme

- International Engineering Advisory Committee meeting in U.S. – September 2014
- UMaT affiliation agreement – October 2014
- Application to National Accreditation Board (NAB) of Ghana – December 2014
- NAB Panel Visits – February 2015

Industry Stakeholder's Meeting

In your opinion, how important are the following in an undergraduate engineering education? Please rate each on a scale of 5: very important to 1: not important.

91%	Communication
91%	Design thinking
91%	Integrity / ethics
91%	Systems thinking
88%	Real world projects in a local context
88%	Teamwork
84%	Continuous assessment of graded work
71%	Strong general engineering coursework
68%	Varied courses in the engineering discipline
65%	Computer programming
23%	Fluency in the French language

When you are looking at a recent engineering university graduate's C.V., how important are the following? Please rate each on a scale of 5: very important to 1: not important.

91%	Projects / practical work
85%	Quality of engineering programme
73%	Internship experiences
70%	Practical skills with machines, computers
63%	Particular courses taken
43%	Student organization leadership experience
43%	Graduation honours
40%	Community service / engagement
38%	Course grades
31%	Prestige of University
25%	Travel or international experience
20%	Fluency in multiple spoken languages

Gaps in Engineering Graduates' Skills and Knowledge

- Critical thinking, general problem solving
- Social skills
- (Gender &) diversity issues
- Writing and communication
- General professional skills, work ethic, and ethics in general
- System-level thinking and planning a system from design through maintenance
- Environmental issues, health & safety issues
- Knowledge of and experience with instrumentation and experimentation

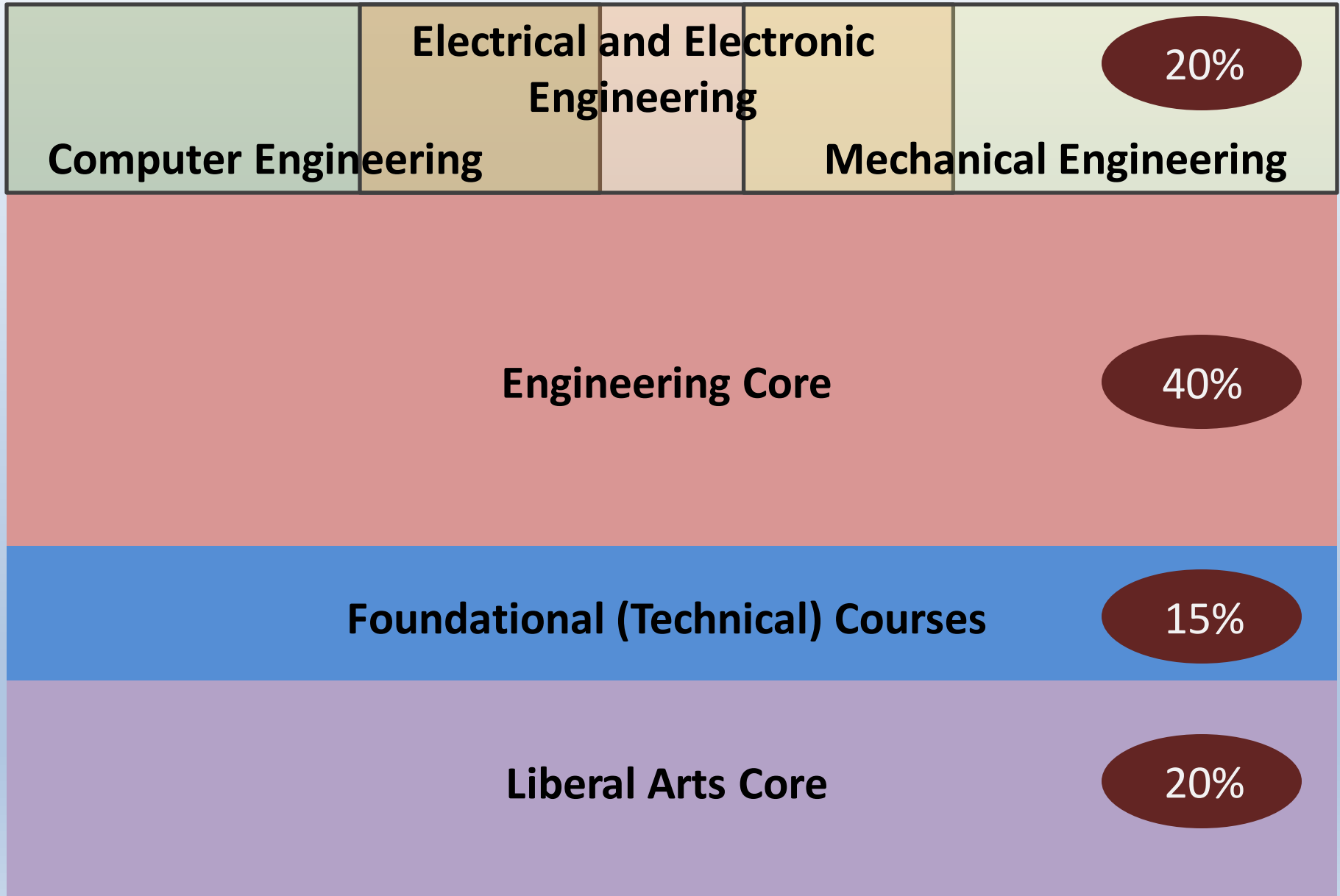
Engineering at Ashesi: Core Strengths

Goal: Educate tinkerers who will create engineering solutions for local needs

- Design & Entrepreneurship
- Hands-on projects
- Real world experience via monitored projects and internships
- Commitment to gender balance
- 300 students, 1/3 of student population



Ashesi's Engineering Programme



Liberal Arts

Essential Skills

- Giving Voice to Values
- Written & Oral Communication
- Leadership Seminars 1-3
- Design & Entrepreneurship 1-2

Breadth and Critical Thinking

- Text & Meaning
- Social Theory
- African Studies
- Economics

Foundational Courses

- Calculus 1 & 2
- Statistics for Engineering
- Computer Programming
- Leadership Seminar 4 + Third Year Service Learning Project

Engineering Core

Math & Science

- Physics: Mechanics
- Physics: Electromagnetism
- Material Science & Chemistry
- Multivariable Calculus & Linear Algebra
- Differential Equations & Numerical Methods
- Applied Programming for Engineers

Engineering

- Introduction to Engineering
- Circuits & Electronics
- Instrumentation for Engineering
- System Dynamics
- Control Systems
- Digital Electronics & Computer Systems
- Project Management & Professional Practice
- Senior Project 1 & 2

5 Required Disciplinary Courses

Plus 2 Disciplinary Electives

Computer

- Communication Systems
- Embedded Systems

- Data Structures & Algorithms
- Operating Systems
- Networks & Distr. Computing

Electrical & Electronic

- Advanced Electrical Machines & Power Electronics

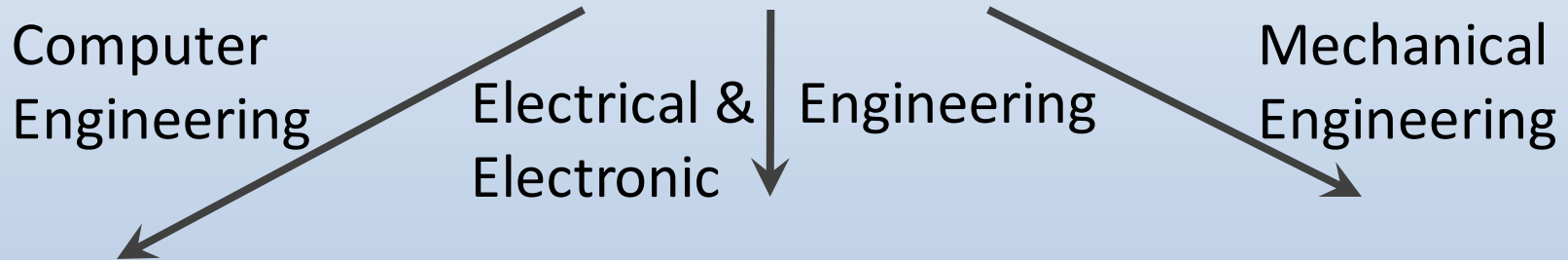
- Intro to Electrical Machines & Power Electronics
- Fundamentals of Thermal Fluid Science & Heat Transfer

Mechanical

- Mechanics of Materials / Structural Engineering
- Mechanical Machine Design
- Thermal Systems & Applications

Engineering Electives

- Environmental Engineering
- Robotics
- Some Business and Economics Courses



- Most CS Courses
- Some EE Courses

- Digital & Analog Signal Processing in Telecommunications
- Power Engineering
- Power Systems Analysis
- Any ME Course
- Some CS Courses

- Fluid Mechanics & Applications
- Most EE Courses
- Some CS Courses

Practical Training

**Third Year Service
Learning Project &
Seminar**

- Team project
- Multidisciplinary
- Requires community involvement
- Students determine their learning goals

Internship

**Fourth Year:
Capstone or
Corporate Project**

- Individual or small group
- Substantial written and oral presentation
- Corporate Project: real-world engineering design & application

Conclusion

- Small engineering programme in small liberal arts-based University in West Africa
- General engineering based
- Emphasis on hands-on projects
- Focused study and discussions around leadership and ethics
- Developed in consultation with multiple stakeholders, and with local needs in a developing economy in mind

Questions?

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