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ADDIS ABABA INSTITUTE OF TECHNOLOGY
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ADDIS ABABA UNIVERSITY
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African Railway Center of Excellence (ARCE)

Abrham Gebre
Director, ARCE

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Vision

TO BE THE LEADING RAILWAY CENTER IN AFRICA AND CENTER OF EXCELLECE IN RESEARCH, EDUCATION AND TRAINING

Post graduate programs are:

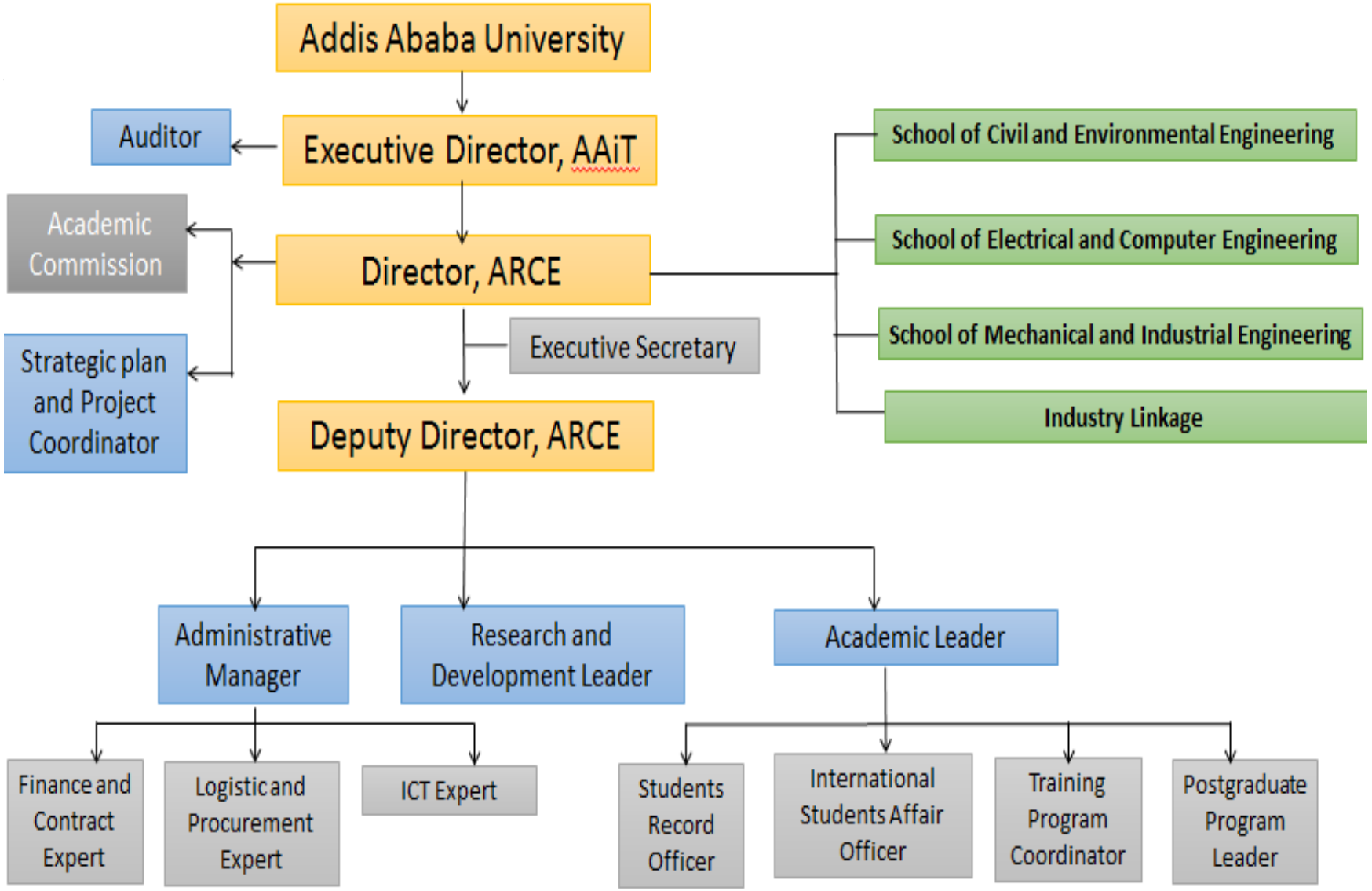
i) PhD Programs

- PhD in Rolling Stock Engineering
- PhD in Civil Infrastructure Engineering
- PhD in Traction and Train Control Engineering
- PhD in Railway System Management

ii) MSc Programs

- MSc in Railway Engineering (Rolling Stock Engineering)
- MSc in Railway Engineering (Civil Infrastructure Engineering)
- MSc in Railway Engineering (Traction and Train Control Engineering)

2.1 ARCE Organizational Structure



2.2. Activities

- 81 students enrolled for 2017/2018 AY
  - 40% of students admitted are regional students which is above the target (20%)
  - 27% of students admitted are female students
  - 17 MSc students are sponsored by DAAD Scholarship (stipend and tuition)
  - All regional students stay at the university accommodation
- Staff Exchange
  - Two visiting professors from SWJIU and NTNU conducted courses

For the current academic year (2018/19 AY)

-35 students are admitted for MSc program and 3 for PhD

- 30% of students admitted are regional
- 6 MSc students are sponsored by **DAAD** Scholarship (stipend and tuition)
- 4MSc students are sponsored by **IUCEA** Scholarship (stipend and tuition)

Student Data

Indicators		Baseline	Y1 2017/18 AY		Y2 2018/19AY		(Cummulative		Performance wrt Target Y1 and Y2 (%)	Performance wrt to Baseline
			Target	Actual	Target	Actual	Target	Actual		
1.Regional students enrolled in ACEs: (i) Masters (No. of Female) (ii) PhD (No. of female)	Masters (Total)	50	10	32	10	15	20	47	235%	94%
	Masters (Female)	15	3	14	3	5	6	19	317%	127%
	PhD (Total)	5	1	1	1	0	2	1	50%	20%
2. Total Students (national and regional)	Masters (Total)	250	50	65	50	33	100	98	98%	39%

- Regional students are from:
  - Uganda, Kenya, Tanzania, Rwanda, Nigeria, Eretria, Somalia, Ghana, Sudan, Malawi, Zimbabwe
- Currently, the first year program is going on successfully (will be completed on mid of March 2019)
- Internship
  - Completed (for 1st batch MSc students)
- PhD Dissertation: Proposals are defended and approved
- MSc Thesis
  - Proposals are defended and approved
  - Progress Defense (will be presented on March 14-15, 2019.
- 1 expatriate staff from Rwanda
- 4 visiting professors (Norway, China and Korea)
- Educational visits were organized at the railway industry

DLI 2

- Peer reviewed journals/conference paper
  - Since June 2016, 10 papers are published (by students, staffs)
- Partnership collaboration
  - SWJTU-MoU: Signed
  - On the 1st African Japanese forum, potential partners are identified
    - Sophia University : MoU is prepared and ready to sign the agreement
    - Yokohama National University: MoU is prepared and ready to sign the agreement
  - Norway institute of Technology- on Progress
  - MOU is ready to sign with Bombardier (Private partner)
  - IIT (India)

- Faculty Exchange
  - Last year, two staffs went abroad for PhD study (SWJTU)
- Benchmarking
  - On progress
- External Revenue generation

  - Accepted students sponsored by **DAAD** (about 39,000USD)

  - **IUCEA (**not yet paid)
- Procurement Audit Report- On progress
- Timely Submission of Financial Audit Report
  - Completed and the report was submitted to the WB Group (AA Office)
  - Posted on web page of the center

Staff Development

- PhD students (since 2017, seven staffs went abroad)
  - SWJIU- 5
  - KRRI-2

- Training
  - Workshop was delivered for 30 students and staff members (by Bombardier)
  - Other training areas are identified and to be delivered during semester break of the 2018/19AY.

Program Accreditation

- Curricula revised and approved by the university senate
- National accreditation –
  - AAU Senate: approved the curricula
  - HERQA (Higher Education Relevance and Quality Agency
    - … On Progress (will be completed within 3-5 months)
- International acceleration
  - Collection and organization of data in progress (because, as a center, one batch should be graduated)
  - Identifying acceleration agencies
    - ABET and ENAEE (European Network for acceleration of Engineering Education)

Research Areas

1. Developing Optimum Inspection, Maintenance and Renovation of Railway Infrastructure

- Signaling and communication systems, Power supply, Rolling Stock components,

2. Quality assurance and evaluating the performance of Railway Infrastructure

- Hydrology and hydraulic, Railway Crossing facilities, and others
- Wheel – Rail Interaction
- Track structure,
- Bridges and Tunnels

3. Capacity analysis of Railway System

- Integration of Railway Systems
- Operations, management

MSc Courses

Civil Infrastructure (M.Sc. and M.Eng.)

Crs. Code	Crs. Title	ECTS	Cr.	Lec.	T/L
REGM 6101	Railway Geometry and Facilities Design	7	3	3	3
REGM 6102	Railway Track Engineering	7	3	3	3
CENG 6901	Transportation Soils and foundation Engineering	7	3	3	3
CENG 6902	Railway Tunnel Engineering	7	3	3	3
CENG 6903	Railway Bridge Engineering	7	3	3	3
CENG 6904	Applied Hydrology and Drainage	7	3	3	3
	Total	49	21	21	21

Module Code	Module Title	ECTS	Cr.	Lec.	T /L
REGM-6007	Railway Project Management	7	3	3	3
REGM 6103	Advances in Railway Engineering	7	3	3	3
CENG 6905	Railway Construction Materials and Equipment	7	3	3	3
REGM 6301	Wheel-Rail Interaction	7	3	3	3
CENG 6502	Finite Elements Methods	7	3	3	3
REGM 6005	Railway Safety and Risk Management	7	3	3	3

Module Code	Module Title	ECTS	Cr.	Lec.	T /L
REGM-6001	Mathematical Foundations in Engineering	7	3	3	3
REGM-6004	Railway Transport planning and Operations Management	7	3	3	3
REGM-6006	Professional Practice				
REGM 7001	Research Methods and Seminar	7	3	3	
REGM-7002	MSc. Thesis	30	15	-	-
REGM-7003	Project Seminar	18	9	-	-
	Total	**14**	**6**	**6**	**6**

Rolling Stock (M.Sc. and M.Eng.)

Module Code	**Module** Title	ECTS	Cr.	Lec.	T /L
REGM-6001	Analytical Methods in Engineering	7	3	3	3
REGM-6004	Railway Transport planning and Operations Management	7	3	3	3
REGM-7002	MSC Thesis	30	15		
REGM-7003	Project Seminar	18	9		
REGM-6006	Professional Practice				

Module Code	**Module** Title	ECTS	Cr.	Lec.	T /L
REGM -6301	Wheel/Rail Interaction	7	3	3	-
REGM -6302	Rail-Vehicle System Dynamics	7	3	3	3
MEng-6402	Rail Vehicle Design	7	3	3	
REGM -6008	Rail Motive Power	7	3	3	
REGM -6304	Rolling Stock Construction and Maintenance	7	3	3	3

Module Code	**Module** Title	ECTS	Cr.	Lec.	T /L
REGM -6305	Rolling Stock Braking System	7	3	3	3
REGM -6306	Mechatronics for Railway	7	3	3	3
REGM- 6308	Rolling Stock Operation, Reliability and Investigation	7	3	3	3
MEng-6010	Instrumentation and Microprocessor Control	7	3	2	3
REGM -6007	Railway Project Management	7	3	3	3
MEng-6005	Finite Element Methods	7	3	3	3

Traction and Train Control (M.Sc. and M.Eng.)

Module Code	Module Title	ECTS	Cr.	Lec.	T /L
ECEG-6806	Rolling Stock Power Electronics and Electrical Drives	7	3	3	3
REGM-6212	Traction Power and Overhead Contact Systems Design	7	3	3	3
ECEG-6808	Telecommunication Systems and Networks for Railways	7	3	3	3
REGM-6214	Railway Signaling and Interlocking	7	3	3	3
REGM-6216	Railway Control System and Automation	7	3	3	3

Module Code	Module Title	ECTS	Cr.	Lec.	T /L
REGM-6005	Railway Safety and Risk Management	7	3	3	-
REGM-6007	Railway Project Management	7	3	3	3
ECEG-6813	Electromagnetic Interference & Compatibility for Railway Systems	7	3	3	3
REGM-6218	Railway System Simulation	7	3	2	3
REGM-6219	Advanced Topics in Railway Engineering	2	1	2	-
REGM-7001	Research Methods and Seminar	7	3	3	-

Module Code	Module Title	ECTS	Cr.	Lec.	T /L
REGM-6001	Mathematical Foundations in Engineering	7	3	3	3
REGM-6004	Railway Transport planning and Operations Management	7	3	3	3
REGM-6006	Professional Practice	-	-	-	-
REGM-6008	Rail Motive Power	7	3	3	3

PhD Proposals

1. Fault tree Model to Investigate Impact of Drainage Problems on Sustainable Railway Operation
2. Public Private Partnership framework for Railway projects in Ethiopia.

   (A study on Addis Ababa -Moyale-Lamu port -South Sudan railway project/LAPSSET & Metema- Wereta-Weldiya-Tadjoura railway project)

3. Developing a Cost Effective Framework for Infrastructure Maintenance Decision Making of Ethiopian Railway Networks
4. A Framework for a Full interoperability of East African Rail Network

5. A study on fastening system optimization for heavy hauls and high speed track: Mechanistic behavior
6. Studies on Control of AC Motors and Design of a Safe and Reliable Drive Control for Traction Applications

PhD Proposals . . . Cont'd

7	Evaluation of Higher Generation Networks for Better Safety, Operation, Efficiency and Management of Railway with Case Studies in Africa
8	Design of Energy efficient solutions for Optimum usage of Regenerative Energy; Case study Addis Ababa Light Rail Project
9	Determination and Simulation of Wheel - Rail Profile Evolution Due to Wear
10	Design Improvement of Wheel Mount Disc in Braking Systems of Railway Vehicles Using Optimum Material and Geometry
11	Integration of Alternative and Renewable Energy Sources for Traction Application: A Case Study of Ethiopian Railway System
12	Reactive Power Compensation in 25kv 50 Hz AC Electrified Railways Power Supply System: In the Case of Ethio-Djibouti Mainline Railway Corridor

PhD Proposals . . . Cont'd

13 Railway System Technology Diffusion Process in Ethiopia for Technology Development and Innovation

14 Developing a Better Material of Switches and Crossings to Minimize the Wearing Effect

15 Rolling contact fatigue failure analysis of railway wheels under cyclic load

16 Safety-Critical Train Positioning System Development Using Data Fusion Technique

17 Dynamic Railway Construction Project Risk Assessment

Thank You!