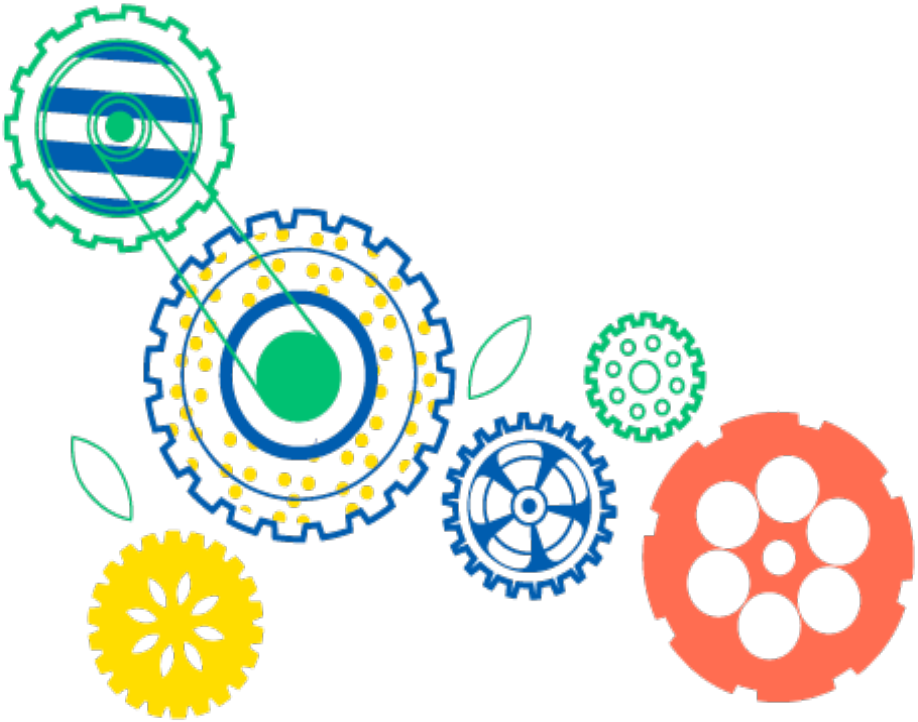
Co-funded by the Erasmus+ Programme of the European Union

PEESA III: Personalized Engineering Education in Southern Africa

Prof. AP Staak
Cape Peninsula University of Technology

FOCUS OF THE PEESA PROJECT

Co-funded by the Erasmus+ Programme of the European Union



0.4-0.5 JULY 2

ENGINEERING EDUCATION
FOR THE XXI CENTURY

HOW IS THE 21ST CENTURY DIFFERENT?

Co-funded by the Erasmus+ Programme of the European Union

- Socio, political and economic Impact
- Stakeholder consultation
- Risk
- Ethics

Impact of Engineering Decisions

Global Challenges, Complex Projects

- Climate, water, energy, food, sustainability
- Transnational,
  - Transdisciplinary
  - Multicultural
    - Integration

Rapid Technological Change

- Life long learning
- Creativity
- Innovation
- 4IR technologies

Internet, Social Media

- Blended learning
- Flexible learning paths
- Student centred learning
- Flipped Class Room

Calls for Engineering Education Reform

Co-funded by the Erasmus+ Programme of the European Union

- **Need for Engineers to broaden their skill set**
  - Technical skills
  - Enabling Skills

- **Need to produce more engineers**
  - Make the profession more attractive (especially among females)

"In addition to the technical skills, engineers must become more aware of the need to work in teams, consider social issues, understand political and economic relations between nations and their peoples and understand intellectual property, leadership, risk management, project management, dispute resolution, multilingual influences, and cultural diversity, as these factors will drive the engineering practice of the 21st century."

P Galloway
American Society for Engineering Education, 2008

Overview of the PEESA project

Co-funded by the Erasmus+ Programme of the European Union

- Implemented in three phases (2013 -2020)
- PEESA I (2013- 2016)

PEESA
Programme on Energy Efficiency in Southern Africa

- PEESA II (2016/17)

PEESA II
Programme on Energy Efficiency in Southern Africa

- PEESAIII (2017-2020)

PEESA III
Personalized Engineering Education in South Africa

Origins of PEESA I

Co-funded by the Erasmus+ Programme of the European Union

- Programme on Energy Efficiency in Southern Africa

PEESA
Programme on Energy Efficiency in Southern Africa

- 3-year Project funded on the EDULINK programme (2013-15)
- EU funded programme as part of the ACP-EU cooperation

Consortium Members

Co-funded by the Erasmus+ Programme of the European Union

European Partners

Hochschule Wismar (HSW)
Hochschule Flensburg (FUAS)
Ernst Abbe Hochschule Jena (EAH)

Associate member

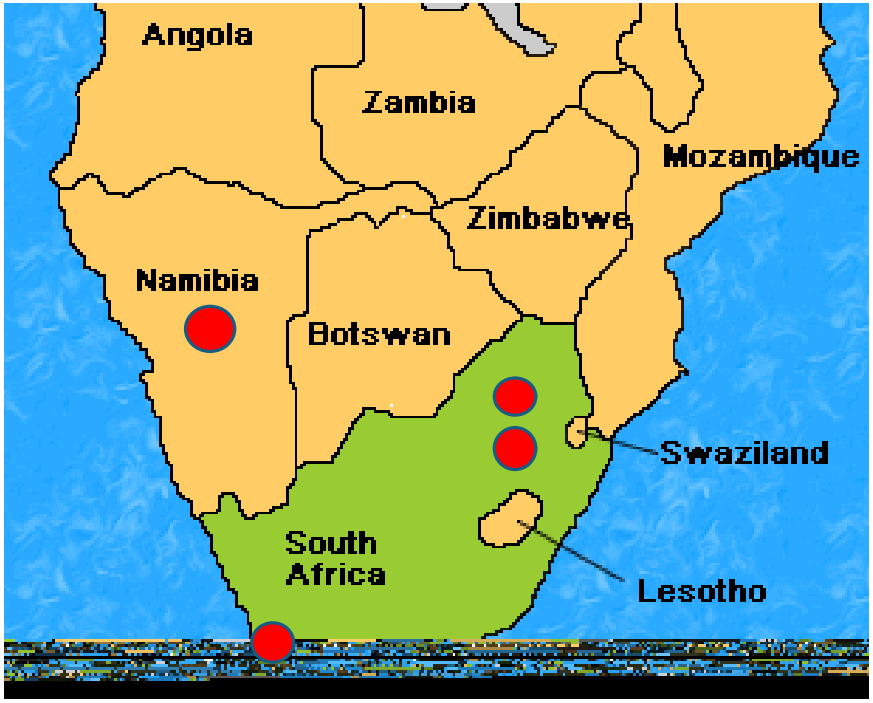
ENAEE (European Network for the Accreditation of Engineering Education)

Consortium Members

Co-funded by the Erasmus+ Programme of the European Union

Southern African Partners

- Cape Peninsula University of Technology (CPUT)
- Tshwane University of Technology (TUT)
- Vaal University of Technology (VUT)
- Namibia University of Science and Technology (NUST)



Rationale for PEESA I

Rationale for PEESA I

Co-funded by the Erasmus+ Programme of the European Union

- **In sub-Saharan Africa (ex SA) more that 50% of the population have no access to electricity**
  - Generating capacity inadequate
  - reliability, affordability is an issue
  - Heavily reliant on diesel generators

- **In South Africa, while more than 80% of population have access to electricity**
  - more than 90% of power comes from coal fired power stations.
  - problem of aging infrastructure, deferred maintenance

Rationale for PEESA I

Co-funded by the Erasmus+ Programme of the European Union

- **Solution:**
  - Increase generating capacity in an environmentally sustainable way (major focus on renewable energy)
  - Improve energy efficiency
  - Introduce demand side management

- **Challenge:**
  - Major shortage of skills to meet future energy needs

Objectives of PEESA I

Co-funded by the Erasmus+ Programme of the European Union

Master degree in Energy at each partner university

- Professional degree
- Curriculum responding to regional and national needs
- Curriculum developed to EUR-ACE standards

Staff Capacity Building

- Curriculum Development
- On-line learning
- EU-ACE standards

Activities and Outputs

Co-funded by the Erasmus+ Programme of the European Union

Activities

- Workshop on European and national standard alignment
- Workshops on curriculum development; online learning
- Dissemination conferences
- Industry Visits

Specific Outputs

- New master programme on energy
- Guidelines on engineering programme design
- Evaluation of programmes against EU-ACE standards

PEESA III

Co-funded by the Erasmus+ Programme of the European Union

PEESA II

Co-funded by the Erasmus+ Programme of the European Union

PEESA II funded by the BMBF (2016)

PEESA II

Programme on Energy Efficiency in Southern Africa

Federal Ministry of Education and Research

Objectives of PEESA II

Co-funded by the
Erasmus+ Programme
of the European Union

Consortium Members

Co-funded by the Erasmus+ Programme of the European Union

- **European Partners**
  - Hochschule Wismar (HSW)
  - Hochschule Flensburg (FUAS)
  - genio.team GbR, Recklinghausen (service provider for didactic workshops)

- **Southern African Partners**
  - Cape Peninsula University of Technology (CPUT)
  - Tshwane University of Technology (TUT)
  - Vaal University of Technology (VUT)
  - Namibia University of Science and Technology (NUST)

Activities of PEESA II

Co-funded by the Erasmus+ Programme of the European Union

- **Workshops for staff**
  - 2 sets of workshops at FUAS
  - Focus on subject didactics, curriculum design, qualification frameworks, assessment

- **Summer schools for students involving activities and projects**
  - Focusing on bridging cultural differences
  - Promoting multidisciplinary team work
  - Involving
    - students and staff
    - Reflection on experiences

PEESA III
Personalised Engineering Education in South Africa

Co-funded by the Erasmus+ Programme of the European Union

Summer Schools

Activities of PEESA II

Co-funded by the Erasmus+ Programme of the European Union

- **Meetings**
  - Hosted by Southern African partners
- **Dissemination Conference**
  - Hosted in Cape Town
- **Workshop on Blended Learning and the Development of at least one on-line module of the Professional Masters degree in Energy**
- **Activities to create further opportunities for networking and collaboration**

CAPACITY BUILDING FOR SUSTAINABLE DEVELOPMENT

PEESA III

Co-funded by the Erasmus+ Programme of the European Union

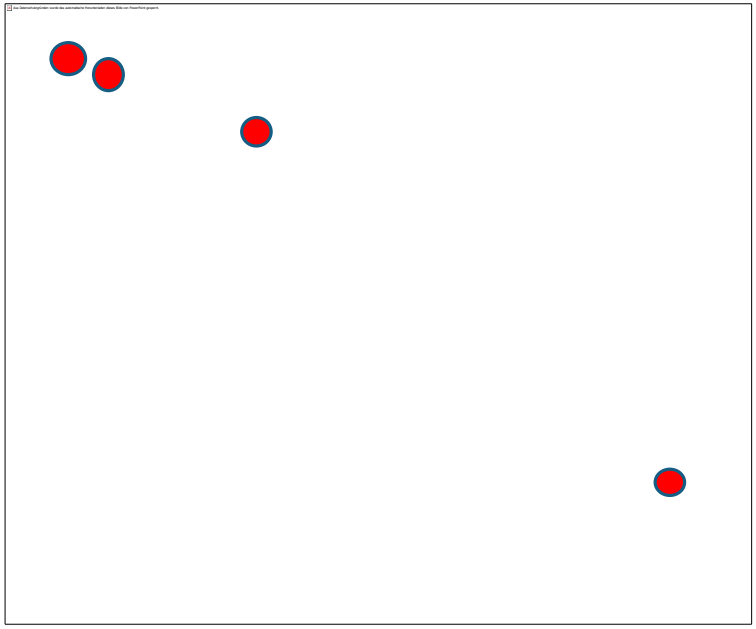
- **PEESA III** (PERSONALISED ENGINEERING EDUCATION IN SOUTHERN AFRICA)
- Funded on the Erasmus + programme of the European Union

Consortium Members

Co-funded by the Erasmus+ Programme of the European Union

- **European**
  - Hochschule Wismar (HSW)
  - Hochschule Flensburg (FUAS)
  - University of Szczecin (USZ)
  - Lucian Blaga University of Sibiu (ULBS)

- **Associate member**
  - ASIIN (Accreditation Agency for Degree Programmes in Engineering, Informatics, the Natural Sciences and Mathematics)



Consortium Members

Co-funded by the Erasmus+ Programme of the European Union

- **South African Partners**
  - Cape Peninsula University of Technology (CPUT)
  - Tshwane University of Technology (TUT)
  - Vaal University of Technology (VUT)
  - Durban University of Technology (DUT)

Rationale For PEESA III

Co-funded by the Erasmus+ Programme of the European Union

Address the problem of acute shortage of Engineers in South Africa

Country	Average population per engineer
South Africa	3166
Malaysia	543
Brazil	227

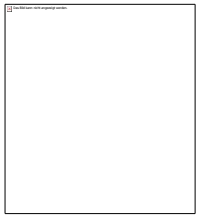
Serious mismatch in supply and demand of skills required for a sophisticated economy

Need to prepare engineers for work in the 21st century

Objectives of PEESA III

Co-funded by the Erasmus+ Programme of the European Union

- **Primary Deliverable:**
  - Three professional masters degrees in engineering
  - Mutually recognized by partners (with mutual cooperation agreements)
  - With completed application for EUR-ACE accreditation



Accreditation Agency for Degree Programmes in Engineering, Informatics, the Natural Sciences and Mathematics

Approach to PEESA III

Co-funded by the Erasmus+ Programme of the European Union

To extend Capacity Building initiatives and build on the outputs of PEESA I and II

PEESA I

- Curriculum development workshops
- Workshop on European and national standard alignment
  - Guidelines on engineering programme design
  - Evaluation of programmes against EU-ACE standards

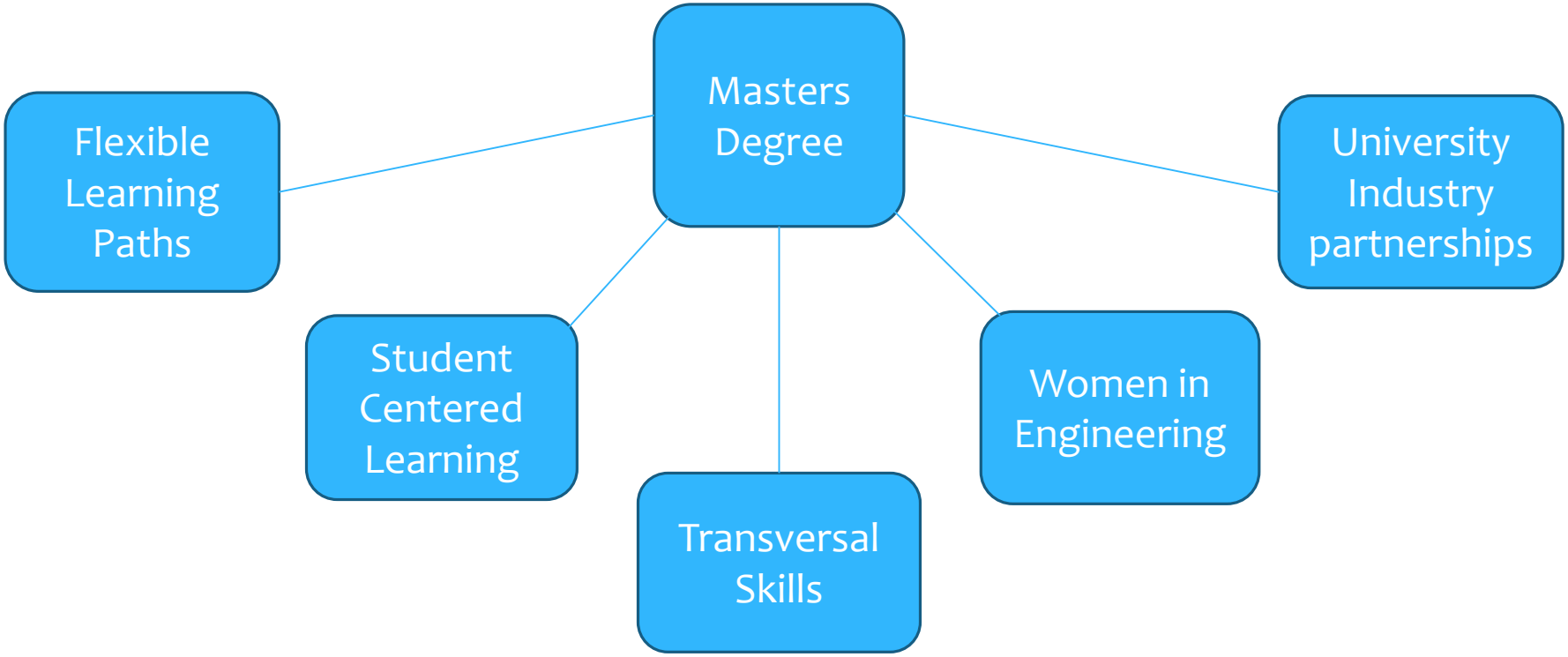
PEESA II

- Workshops on subject didactics
- Workshops on blended learning
- Activities to promote multicultural and interdisciplinary teamwork

Additional objectives of PEESA III

Co-funded by the Erasmus+ Programme of the European Union

To build on the "train-the-trainer" concept and add value to these professional master degrees



Activities of PEESA III

Co-funded by the Erasmus+ Programme of the European Union

- Create opportunities for social interaction through meetings/workshops/conferences at each partner institution
- Engagement with regional government
- Excursions to and interactions with industry partners
- Presentations, discussions and input on
  - EUR-ACE standards and accreditation
  - Good practice in promoting women in engineering
  - Creating flexible learning paths
  - University-Enterprise cooperation
  - Curriculum and programme development

Activities of PEESA III

Co-funded by the Erasmus+ Programme of the European Union

- Good practice presentations
- Engagement with regional governments, industry Interactions
- Position paper, recommendations

- Workshop on Blended Learning
- Support for curriculation process
  - On-line learning module

- Good practice presentations
- Student Survey
- Staff survey
- Position Paper, recommendations

- On-line module on Transversal Skills
- Business Simulation Module

Co-funded by the
Erasmus+ Programme
of the European Union

Objectives of PEESA I

- **Primary deliverable:** a Masters degree in Energy at each of the Southern African Universities
  - Professional masters degree (mainly course-work)
  - Curriculum responding to regional and national needs
  - Curriculum developed according to European Quality Standards for Engineering Education

- **Secondary deliverable:** Staff Capacity Building

Reflections on PEESA
(What were the success factors?)
(17,6% success rate)

- Relevance of the topic
  - Address the skills shortage in the energy sector and engineering
- Acknowledged the changing Higher Education context in partner countries
  - New Higher Education Qualifications Framework
  - Need for flexible learning paths
  - Focus on internationalization
  - Focus on "softer skills" in engineering
- Strong project management
- Champions at the partner institution
- Optimize Networking opportunities
  - Workshops/Conferences/Meetings

Co-funded by the Erasmus+ Programme of the European Union