



# Human Kinetics and Ergonomics



Prof Matthias GÖBEL



What is HKE?

- Focus and aspects of study
- Basic concepts & application areas
- Professional perspectives
- Study organisation
- Questions

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## Terminology of HKE



**Kinesis:**  
Greek for *motion*



Understanding the complex eclectic nature of human movements

**Ergonomics:**  
Derived from the Greek *ergon* (work) and *nomos* (laws)



The science of work, a systems-oriented discipline which now extends across all aspects of human activity

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## Example 1: Sport



Physical fitness and motor skills as constituents of performance



Physical fitness



Force and speed



Motor Control

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## Example 2: Worklife

Physically demanding work



Use of equipment and technology



Hazardous conditions



High tech production systems



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## The holistic approach of HKE

Stimulus

Movement



- Sensor systems
- Perception
- Recognition



- Brain
- Memory
- Motor system



- Skeletal framework
- Musculature
- Body composition

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## The holistic approach of HKE

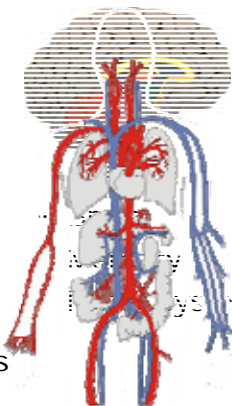
Stimulus

Movement



- Sensor systems
- Perception
- Recognition

- Social interaction
- Emotional reactions



- Cardio-vascular system
- Lung functions
- Metabolic system

- Nutrition and hydration
- Environment

- Skeletal framework
- Musculature
- Body composition

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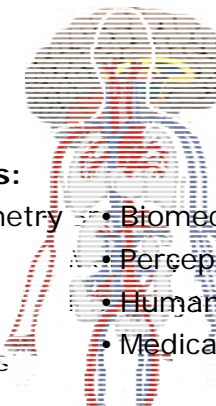
## The holistic approach of HKE

Stimulus

Movement



- HKE I/II/III modules:**
- Anatomy & Anthropometry
  - Data Analysis
  - Physiology
  - Ergonomics



- Cardio-vascular system
- Lung functions
- Metabolic system

- Biomechanics
- Perception and Motor Control
- Human Information Processing
- Medical Technology

- Nutrition and hydration
- Environment
- Skeletal framework
- Musculature
- Body composition

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- Focus and aspects of study
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**The HKE philosophy**

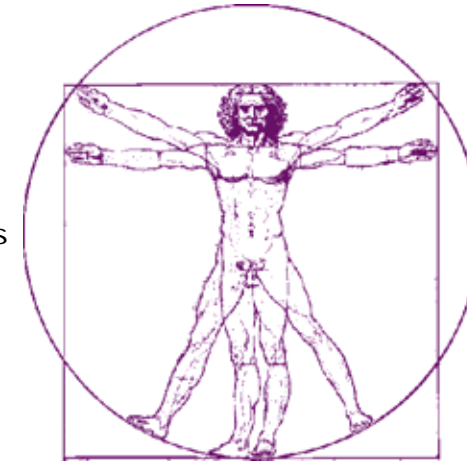


**The HUMAN in the center of study**

Work

Daily activities

Sport



Performance

Efficiency

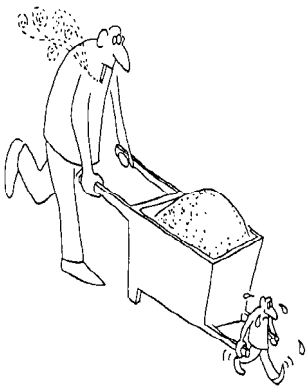
Health

Well-being

*Leonardo da Vinci: Vitruvian Man  
(trying to establish a natural harmony  
of body proportions)*



**Human variability**



Identical load induces individually varied strain

**Correspondence of load and strengths**



Human capabilities

Tasks and demands

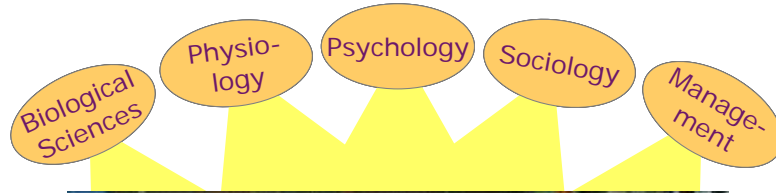


**The short and the tall**



& the consequences

## The multi-disciplinary nature of HKE



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## Some research examples (1)



Study of pushing and pulling tasks

Impact of canoe carriage



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## Some research examples (2)



Maximum physiological responses of trained and untrained persons



Study of overhead work



Study of heat stress in automotive industry

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## Some research examples (3)



Learning of golf swing

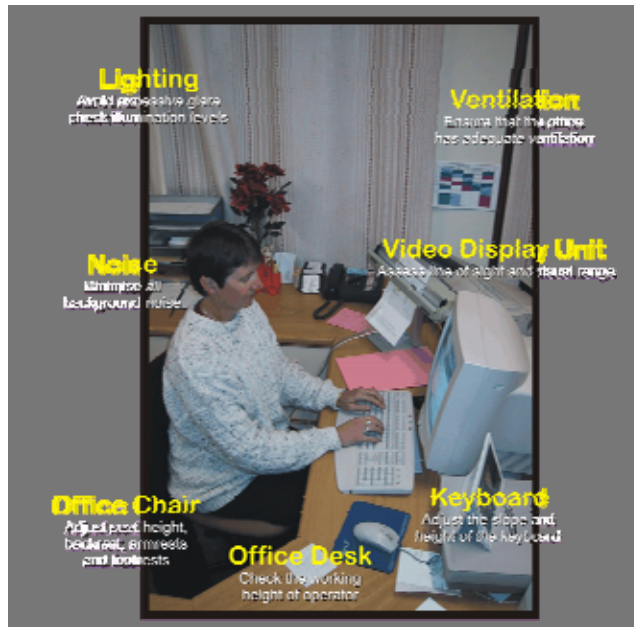


Back strain of sheep shearers



Hospital ergonomics

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Problem:  
lack of movement

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What can you do with all this wonderful information?

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## Widespread professional perspectives



Optimize performance and provide health

Human Kinetics and Ergonomics

**Sport Science**  
Assist sportspeople

**Ergonomics**  
Analysis and design  
of workplaces

**Biokinetics**  
Provide exercise  
therapy

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## Activities of former HKE students



- Occupational ergonomics manager in automotive industry
- Professional gym trainer / instructor
- Safety manager in railway systems
- Fitness trainer of rugby team
- Ergonomics designer for military equipment
- Ergonomist in mining industry
- Biokineticist practitioner
- Fitness and nutrition consultant
- Specialist for wheelchair design
- Risk and quality auditor in consultancy company
- Salesperson for medical products

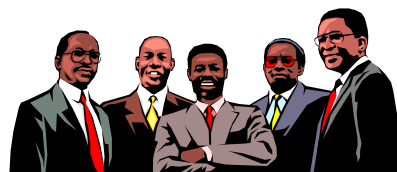
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## Cooperation Partners of HKE



CSIR (Johannesburg)  
ErgoTech (Johannesburg)  
Cadbury's SA (Port Elizabeth)  
Continental Tyres (Port Elizabeth)  
General Motors SA (Port Elizabeth)  
Johnson & Johnson (East London)  
Mercedes Benz SA (East London)  
NIOH (National Institute of Occupational Health, Johannesburg)  
EP Rugby, SA Rugby  
Toyota SA (Durban)  
VW SA (Port Elizabeth)  
...



## Options for HKE graduates



Flexibility of the HKE course: Access to all areas (Sports, Ergonomics, Rehabilitation) with the one HKE degree

Graduates are accepted by all major overseas universities (e.g. Loughborough, Nottingham) without additional courses

Safe perspective: Human health and human performance will always be important

HKE degree is unique in SA for its versatility

Mostly more job options than graduates in South Africa

## Overview



- Focus and aspects of study
- Basic concepts
- Application areas
- Professional perspectives
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How to get a degree?

## HKE degree (BSc or BA)



2011	2012	2013	2014
<u>HKE I</u>	<u>HKE II</u>	<u>HKE III</u>	<i>HONOURS</i>
<u>2<sup>ND</sup> M I</u>	<u>2<sup>ND</sup> M II</u>	<u>2<sup>ND</sup> M III</u>	
<u>? I</u>	<u>? I/II</u>		
<u>? I</u>	<u>(? I/II)</u>		

## How to acquire this Knowledge

- Lectures: Basic facts AND how to use them  
Laboratory work: Practical application  
Tutorials: Interactive discussions



4 large and well equipped laboratories at HKE



Students are exposed to practical experiences from first year on

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## Other subjects related to HKE

### From secondary education:

- Science
- Biology
- Mathematics
- Life Orientation
- Design

all useful, but HKE provides options to catch up deficits

### Other subjects to combine with HKE:

- Psychology (BSc, BA)
- Biochemistry, Microbiology (BSc)
- Mathematics, Statistics (BSc)
- Computer Science (BSc)
- Chemistry (BSc)
- Anthropology, Sociology (BA)
- Drama (BA)
- Management, Commerce (BCom, needs permission)
- Journalism (BA, BJourn)
- ..

any combination does make sense for professional purposes

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## Further Information

Please come visit the department any time during Orientation Week



### Location:

Upper African Street between Gym and Sports Administration

### Contact:

Phone: 046 - 603 8468

Fax: 046 - 603 8934

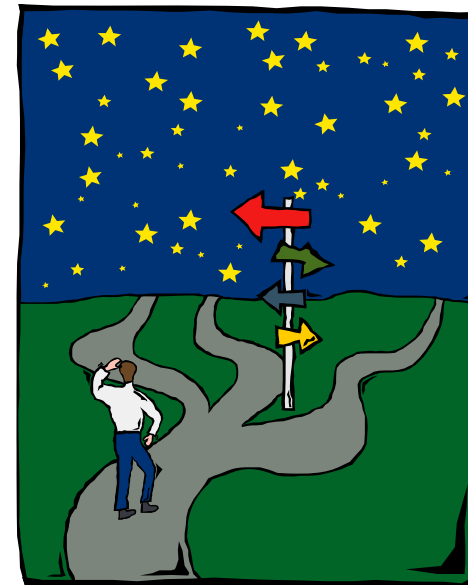
email: [hke@ru.ac.za](mailto:hke@ru.ac.za)

### Internet:

<http://www.ru.ac.za/hke/>

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## Questions?



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