



UNIVERSITY OF  
ZULULAND

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## Department of Mathematical Sciences

02 July 2020

To International Mathematical Union (IMU)

Subject: A report on AWMO19

The first African Workshop on Mathematical Optimization was successfully held in the University of Zululand from 11 – 15 November 2019. Forty-eight participants, including the speakers, took part in the school. Participants from eight different countries in Africa. Four professors from South Africa and three professors from other African countries deliver short courses (see attached the handout for details).

The event was mainly supported by the University of Zululand, International Mathematical Union (IMU), European Mathematical Society (EMS) and the Department of Science and Technology, South Africa (DST).

The event was hosted in the main campus of the University of Zululand. Participants started to arrive on the 10<sup>th</sup> of November and they were accommodated in the university guest house while the speakers were accommodated in the nearest hotel. A transportation was arranged to and from the hotel every day along with the drop off and pick up of speakers and participants from the airport, which is almost two hours' drive from the University. The school was opened by the dean of faculty of science of the University. Compact courses were delivered on linear programming, non-linear programming, stochastic programming, large scale optimization, multi-level optimization, dynamic programming and metaheuristics. The school was appreciated and welcomed by the participants and also the speakers. A meeting was held involving the speakers and some of the international participants on the way forward in popularizing mathematical optimization in Africa on the evening of November 14. It is outlined the need and a suggestion to held the event once in two years in different African university is proposed, a committee is set to discuss it further (see the minutes attached).

We would like to thank the International Mathematical Union for the support which enable us to sponsor students from other African countries to take part in the school.

Dr Surafel L Tilahun

Dr Maba B Matadi

Chairs of AWMO19



# AWMO 2019

## African Workshop on Mathematical Optimisation

University of Zululand

11-15 November 2019

Dear Attendees

African Workshop on Mathematical Optimization 2019 (AWMO2019) is the first optimization school prepared in the department of Mathematical Sciences, University of Zululand. With the target of introducing state of the art methods and developments in mathematical optimization, the school addresses variety of topics in the field. The school is generously supported by the Department of Science and Technology (DST), the university of Zululand research office, European Mathematical Society (EMS), International Mathematical Union (IMU), the faculty of science and agriculture of the University of Zululand and University Capacity Development Program (UCDP) under the National Mathematics and Statistics Sciences Teaching Development. It is also endorsed by the African Mathematical Union and the Operations Research Society of South Africa (ORSSA).

Main topics including linear and non-linear programming, stochastic optimization, large scale optimization, dynamic optimization, multilevel programming and game theory along with computational optimization specifically metaheuristics will be discussed in the school. The complete program is attached.

Even though a large number of people are interested in the workshop, unfortunately based on the capacity of the organization planned, we have accepted about 18% of the applications. Participants from seven international institutes, nine South African institute and one from an Industry are accepted for participation.

Workshop wifi for the period of the workshop

User: wifi

Password: Unizulu123

We wish you to have a fruitful stay in the University of Zululand main campus.

Organising Committee



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# AWMO 2019

## African Workshop on Mathematical Optimisation

University of Zululand

11-15 November 2019

### Program

Date	Time	Topic	Speaker	Venue
11 November 2019 Monday	08:30 – 08:45	Opening address	Prof NW Kunene, Dean of Faculty of Science and Agriculture	LT07
	08:45 – 10:30	Linear Programming	Dr S Krishnannair	
	10:30 – 10:45	Tea break		
	10:45 – 12:30	Non-linear programming	Dr JM Ngnotchouye	
	12:30 – 13:15	Lunch		
	13:15 – 15:00	Non-linear programming	Dr JM Ngnotchouye	
	15:00 – 15:15	Tea break		
12 November 2019 Tuesday	08:30 – 10:30	Large Scale Optimization	Prof M Ali	LT07
	10:30 – 10:45	Tea break		
	10:45 – 12:30	Large Scale Optimization	Prof M Ali	
	12:30 – 13:15	Lunch		
	13:15 – 15:00	Large Scale Optimization	Prof M Ali	
	15:00 – 15:15	Tea break		
13 November 2019 Wednesday	08:30 – 10:30	Multilevel Programming & Game Theory	Prof SM Kassa	LT07
	10:30 – 10:45	Tea break		
	10:45 – 12:30	Multilevel Programming & Game Theory	Prof SM Kassa	
	12:30 – 13:15	Lunch		
	13:15 – 15:00	Multilevel Programming & Game Theory	Prof SM Kassa	
	15:00 – 15:15	Tea break		
14 November 2019 Thursday	08:30 – 10:30	Stochastic Optimization	Prof OM Pamen	HP03
	10:30 – 10:45	Tea break		
	10:45 – 12:30	Dynamic Programming	Prof BM Ndiaye	
	12:30 – 13:15	Lunch		
	13:15 – 15:00	Dynamic Programming	Prof BM Ndiaye	
	15:00 – 15:15	Tea break		
15 November 2019 Friday	08:30 – 10:30	Metaheuristics	Dr SL Tilahun	HP03
	10:30 – 10:45	Tea break		
	10:45 – 12:30	Metaheuristics	Dr SL Tilahun	
	12:30 – 13:15	Lunch		
	13:15 – 15:15	Students presentation		
	15:15 – 15:45	Tea break		
	15:45 – 16:00	Closing		



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# AWMO 2019

## African Workshop on Mathematical Optimisation

### University of Zululand

11-15 November 2019

### Participants

No		Name	Email	Institute
1	Ms	Abdelhameed, Marwa Zainelabdeen	Marwazinabdeen@gmail.com	University of Khartoum, Sudan
2	Dr	Afassinou, Komi	AfassinouK@unizulu.ac.za	University of Zululand, South Africa
3	Prof	Ali, Montaz	Montaz.Ali@wits.ac.za	University of the Witwatersrand, South Africa
4	Mr	Bayih, Semeneh Hunachew	semehun@gmail.com	Arba Minch University, Ethiopia
5	Prof	Beesham, Aroon	BeeshamA@unizulu.ac.za	University of Zululand, South Africa
6	Ms	Buah, Masha Ahoba	airmasha247@yahoo.com	University of Mines & Technology, Ghana
7	Mr	Cloete, Jacques	CloeteJA@unizulu.ac.za	University of Zululand, South Africa
8	Mr	Dlamini, Welcome	DlaminiW@unizulu.ac.za	University of Zululand, South Africa
9	Mr	Gaye, Calvin Alvin	gcalvin317@gmail.com	University of Liberia, Liberia
10	Mr	Goshu, Natnael Nigussie	natnael.goshu@studenmail.biust.ac.bw	Botswana International University of Science & Technology, Botswana
11	Ms	Gumede, Nosipho	Nosiphonana@gmail.com	University of Zululand, South Africa
12	Mr	Haroon, Ali Mohammed	alialiun@gmail.com	University of KwaZulu-Natal, South Africa
13	Dr	Karangwa, Innocent	Ikarangwa@uwc.ac.za	University of the Western Cape, South Africa
14	Prof	Kassa, Semu Mitiku	kassas@biust.ac.bw	Botswana International University of Science & Technology, Botswana
15	Dr	Krishnannair, Syamala	KrishnannairS@unizulu.ac.za	University of Zululand, South Africa
16	Mr	Kubheka, Mbuyiseni	KubhekaM@unizulu.ac.za	University of Zululand, South Africa
17	Mr	Lebese, Thabang D	thabang@aims.ac.za	University of South Africa, South Africa
18	Mr	Lindokuhle, Mbhense	lindokuhlesandile34@gmail.com	University of Zululand, South Africa
19	Mr	Madide, Melokuhle	Melokuhlem68@gmail.com	University of Zululand, South Africa
20	Mr	Madonsela, Mxolis	Pardonmacdon@gmail.com	University of Zululand, South Africa
21	Ms	Mahinga, Desiree Taliane	taliane@aims.ac.za	Stellenbosch University, South Africa
22	Dr	Matadi, Maba B	MatadiM@unizulu.ac.za	University of Zululand, South Africa
23	Mr	Matibidi, Mogoboya	Matibidicaiphus@gmail.com	University of Zululand, South Africa



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# AWMO 2019

## African Workshop on Mathematical Optimisation

### University of Zululand

11-15 November 2019

No		Name	Email	Institute
24	Mr	Mkhaba, Siphosakhe	Siphomkhaba@gmail.com	University of Zululand, South Africa
25	Ms	Mkhwamubi, Nontokozi	Nontomkhwamubi@gmail.com	University of Zululand, South Africa
26	Mr	Mswehi, Syabonga	Nongalo09@gmail.com	University of Zululand, South Africa
27	Mr	Muleya, Nqobile	Nqomuleya@gmail.com	University of Venda, South Africa
28	Mr	Mxumalo, Sicelo	Scelowonderb@gmail.com	University of Zululand, South Africa
29	Prof	Ndiaye, Babacar Mbaye	babacarm.ndiaye@ucad.edu.sn	Cheikh Anta Diop University, Senegal
30	Mr	Ndobe, Lubabalo	lubabalo@aims.ac.za	AIMS, South Africa
31	Mr	Ngema, Cebolenkosi	cebongema2@gmail.com	University of Zululand, South Africa
32	Mr	Ngema, Fakazi Emmanuel	fakazi05@gmail.com	University of Zululand, South Africa
33	Dr	Ngnotchouye, Jean Medard	Ngnotchouye@ukzn.ac.za	University of KwaZulu-Natal, South Africa
34	Ms	Nkadimeng, Lovness	nkadi1998@gmail.com	University of Zululand, South Africa
35	Mr	Nkosi, Gcwetha	Gcwethankosi@gmail.com	University of Zululand, South Africa
36	Mr	Ozioma, Umeorahneka	umeorahnekaenzioma@gmail.com	North-West University, South Africa
37	Mr	Packa, William Boumba	wp@inoxico.com	Inoxico, South Africa
38	Prof	Pamen, Olivier Menoukeu	O.Menoukeu-Pamen@liverpool.ac.uk	University of Liverpool, UK
39	Dr	Segun, Oke	OkeS@unizulu.ac.za	University of Zululand, South Africa
40	Mr	Sibiya, Siphamandla	SibiyaSI@unizulu.ac.za	University of Zululand, South Africa
41	Mr	Silwimba, Felix	felixs@aims.ac.za	University of Zululand, South Africa
42	Dr	Singh, Vijai	SinghV@unizulu.ac.za	University of Zululand, South Africa
43	Dr	Tilahun, Surafel	TilahunS@unizulu.ac.za	University of Zululand, South Africa
44	Mr	Tirab, Mohammed	mamtirab@gmail.com	University of KwaZulu-Natal, South Africa
45	Prof	Xulu, Sibosiso	XuluSS@unizulu.ac.za	University of Zululand, South Africa
46	Mr	Zondi, Phumlani	ZondiP@unizulu.ac.za	University of Zululand, South Africa
47	Mr	Zulu, Bongisipho	Zulubongisipho@gmail.com	University of Zululand, South Africa
48	Mr	Zvarevashe, Willard	Wzvarevashe@gmail.com	University of Zululand, South Africa



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# AWMO 2019

African Workshop on Mathematical Optimisation

University of Zululand

11-15 November 2019

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<b>Organizing Chairs</b>	Dr Surafel L Tilahun Dr Maba B Matadi
<b>Local Organizing Committee</b>	Prof A Beesham Prof SS Xulu Dr MB Matadi Dr SL Tilahun Dr S Krishnannair Mr J Cloete Mr P Zondi Mr W Dlamini Mr S Sibiya Mr M Kubheka Mr Gcwetha Nkosi
<b>Scientific and Advisory Committee</b>	Prof Hans G Bock, University of Heidelberg, Germany Prof Felix Mora-Camino, Ecole Nationale de l'Aviation Civile, France Prof SM Kassa, Botswana International University of Science & Technology, Botswana Dr JM Ngnotchouye, University of KwaZulu-Natal, South Africa Dr S Krishnannair, University of Zululand, South Africa Prof A Montaz, University of Witwatersrand, South Africa Prof Olivier Menoukeu Pamen, Prof Babacar Mbaye Ndiaye Dr SL Tilahun, University of Zululand, South Africa

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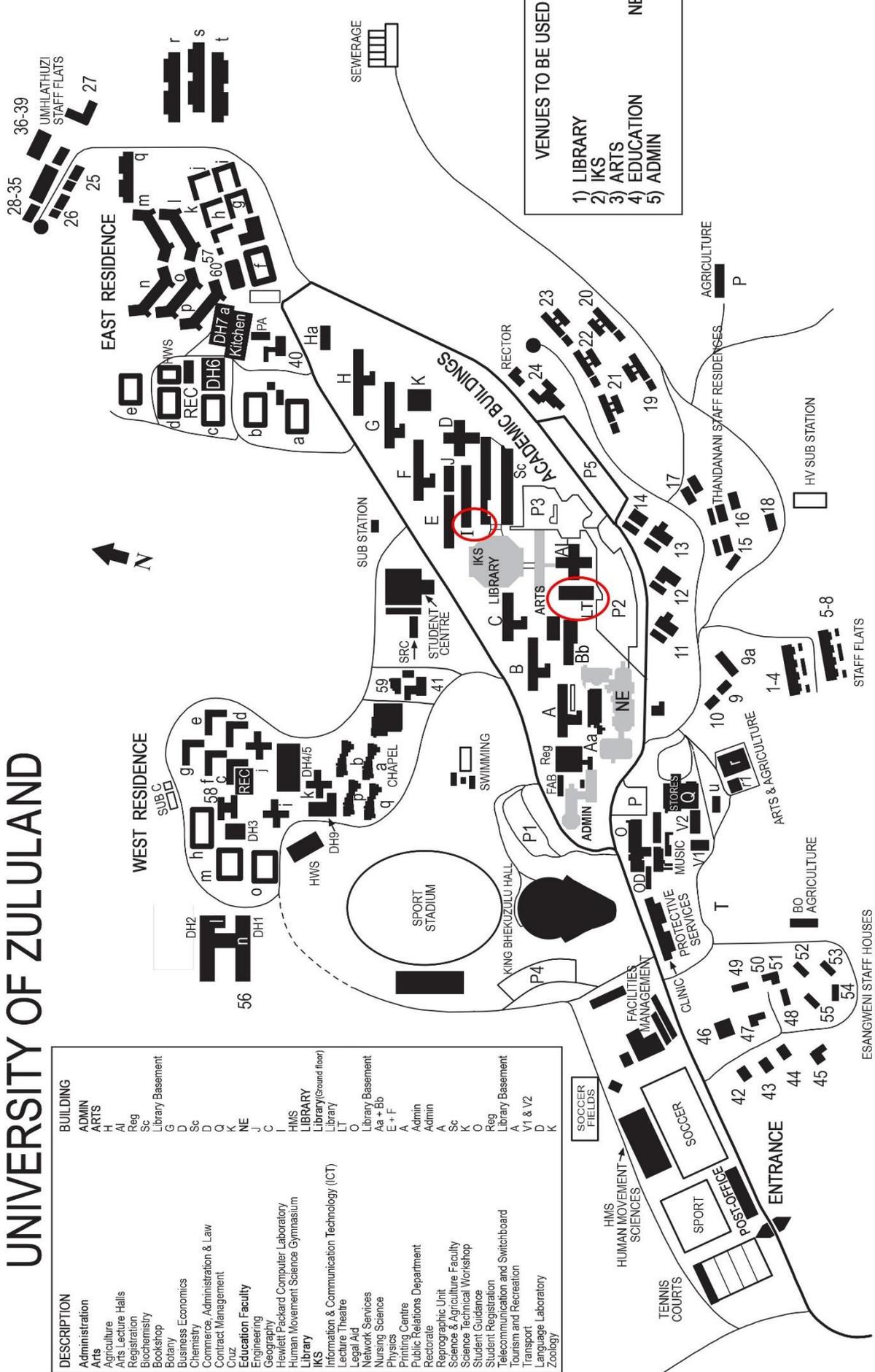
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DESCRIPTION	BUILDING
Administration	ADMIN
Arts	ARTS
Agriculture	H
Arts Lecture Halls	AI
Registration	Reg
Biochemistry	Sc
Bookshop	G
Botany	D
Business Economics	Sc
Chemistry	Q
Commerce, Administration & Law	Q
Contract Management	K
Cruz	NE
Education Faculty	J
Engineering	C
Geography	I
Health Packard Computer Laboratory	HMS
Human Movement Science Gymnasium	LIBRARY
Library	Library (Ground floor)
Information & Communication Technology (ICT)	LI
Lecture Theatre	O
Legal Aid	Library Basement
Network Services	Aa + Bb
Nursing Science	E + F
Physics	A
Printing Centre	Admin
Public Relations Department	Admin
Rectorate	A
Reprographic Unit	Sc
Science & Agriculture Faculty	K
Science Technical Workshop	O
Student Guidance	Reg
Student Registration	Library Basement
Telecommunication and Switchboard	A, V1 & V2
Tourism and Recreation	D
Transport	K
Language Laboratory	
Zoology	



- VENUES TO BE USED**
- 1) LIBRARY
  - 2) IKS
  - 3) ARTS
  - 4) EDUCATION
  - 5) ADMIN
- NE

**MINUTES OF THE 1<sup>st</sup> GENERAL MEETING OF PARTICIPANTS OF 2019 AWMO**  
**HELD ON 14TH NOVEMBER, 2019 AT UNIZULU MATHS DEPARTMENT**  
**CONFERENCE ROOM**

**Members Present**

- |  |                                   |
|--|-----------------------------------|
| 1. Prof Kassa Semu Mitilku             | 11. Mr. Kubheka Mbuyiseni         |
| 2. Prof Ndiaye Babacar Mbaye           | 12. Ms. Mahinga Desiree Tailianee |
| 3. Dr. Tihalu Surafel                  | 13. Ms. Ozioma Umeorahnneka       |
| 4. Dr. Matadi, Maba B                  |                                   |
| 5. Dr. Ngnotchouye, Jean Medard        |                                   |
| 6. Dr. Innocent Karangwa               |                                   |
| 7. Ms. Abdelhhameed Marwa Zainelabdeen |                                   |
| 8. Mr. Bayih, Semeneh Hunachew         |                                   |
| 9. Ms. Masha Ahoba Buah                |                                   |
| 10. Mr. Goughu Natnael Nigussie        |                                   |

**1.0 OPENING**

Dr. Surafel Tihalun called the meeting to order at exactly 6:20 pm. He welcomed members present to the meeting and proceeded to introduce the agenda for the day's meeting

**2.0 BUSINESS OF THE DAY**

**2.1 Suggestions Raised by members to improve next year's workshop**

The following were suggested by members present at the meeting.

- I. **Collaboration among Ourselves:** Prof Kassa suggested that members present should try as much as possible to collaborate among themselves even after the workshop. According to him, Collaborations with participants, organizations and other institutions will be an

avenue for more institutions and individuals to come on board to support the next workshop.

- II. **Increasing the Source of Funding:** It was suggested that, proposals must be sent to companies, Non-Governmental Organizations and other institutions who will be interested in providing funds for the next workshop. Funding organizations such as SIMBA Schools, and SAMSA conference were cited as examples of organizations to target for funding the next event. Members present were therefore asked to inform organizers on companies they know from their respective countries which can provide funds for the next workshop.
  
- III. **Advertising of the Workshop:** A suggestion was made by a member that the workshop should be well publicized so that researchers in the field of Operation Research can attend in their numbers. He emphasized on the fact that, advertising the workshop could be in the form of sharing the call for the application in the various universities of all participants present and also all universities in Africa.
  
- IV. **Involving Experts in the Industry:** It was suggested that in the next conference, expert in the industry should be invited as well, to do presentations on the application of optimization in the industry. This will broaden the scope of knowledge of participants in the application of optimization in the industry so that participants can be well abreast with what is trending in the industry.
  
- V. **Forming of Working Groups:** In order to create networks and interact with each other Prof Kama suggested that working group should be formed in order to facilitate the next workshop
  
- VI. **Other Avenues to Increase the Source of Funding:** Dr. Innocent Karangwa suggested that participants can collaborate and solve industrial problems so that funds received from such consultancies can be used to support the next workshop.

## **2.2 Event to be Added to the next Workshop**

Participants present at the meeting suggested that the following should to be included in the next conference

- I. Presentations to be done by students
- II. Publication of Conference papers
- III. Inviting more people to attend the conference
- IV. Inviting people from Europe and other continents to attend the conference with their own funding
- V. Special edition for publication of one of the mathematics journals

## **2.3 Action Plan**

The next school on optimization was slated for 2021 (next two years). The following were the actions to be taken:

- I. Reports should be sent to funding organizations at the end of the conference
- I. Formation of a steering committee
- II. Committee members to meet and plan for the workshop scheduled for 2021
- III. Format for publication of conference paper should be discuss in the Working group
- IV. Committee members should start working in order to organize the workshop in 2021
- V. All members present are expected to deflect the idea to their various universities.

## **2.4 Committee Members**

The following were nominated to form the steering committee for 2021 African Workshop on Mathematical Optimization

- Prof Kassah Semu Mitilku
- Prof Ndiaye Babacar Mbaye
- Dr. Ngnotchouye, Jean Medard
- Dr. Surafel Tahirel

- Dr. Matadi, Maba B
- Ms Masha Ahoba Buah – Secretary

## **2.5 AOB**

- I. Dr. Surafel briefed the house on the sponsors for the 2019 AMWO which includes European Union of Mathematics, International Mathematical Union, AMU, Department of Science and Technology-Republic of South Africa. He said, applications to some organizations were not successful this year and therefore there is a need to re -apply to such organizations to support the next workshop slated for 2021.
- II. Ms Abdelhameed Marwa Zaiinelabdeen wanted to know if the conference should be on only optimization. The answer was yes since mathematical optimization is a broad and cut across many fields in mathematics and this will attract funding agencies interested in funding optimization workshop.
- III. Dr. Ngnotchouye asked whether the next workshop will be held in South Africa and in Unizulu. Ms Talinee suggested it should be held in South Africa since the idea of establishing the optimization school is still at the early stage however the hosting university can change.
- IV. A member said there is lack of job opportunities for operations research and it is therefore important for academics to explore the need for experts in operations research in Africa.

## **3.0 CLOSING**

The meeting was moved for closure at 7: 10 after there were no further deliberations.

**Recorded by:**

**Ms. Masha Ahoba Buah**

**(Secretary)**