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## FOREWORD

As a member of the Faculty of Engineering in this very noble institution, even though outside for now in the service of my dear state, I feel very honored to write the foreword of this volume. It is a pleasure as well as a duty for me to fully and respectfully support University of Maiduguri in whatever capacity I have been called upon to render my quota to the progress and development of the university.

I am very happy to see that members of my Faculty are making effort to contribute their knowledge in teaching and research for the growth of the university and indeed the nation at large. There are seventeen (17) well researched work presented in this volume and most of which is geared towards the use of locally sourced materials and methods that will go a long way into further developing the economy of Borno state and the nation as a whole.

It's obvious that all the department in the faculty are making effort to be part of this great project. This is because there is at least one paper from each of the seven (7) departments of the faculty. I therefore congratulate members of staff of engineering for a job well-done in pursuing this noble task. I have no doubt that the students being trained in this institution will go a long way to further this activity.

I encourage all members to make every effort in supporting and sustaining this knowledge-driven activity so that the flag of this university can be kept flying.

My door is always open to further my modest support to this Faculty and the university at large.

I wish the Faculty grater success in research and development!



**Engr. Prof. Babagana Umara**

Hon. Commissioner,  
Borno state Ministry of Reconstruction, Rehabilitation  
and Resettlement.

**EDITORIAL NOTE**

I am indeed happy to present to you the eight<sup>th</sup> volume of the Faculty of Engineering Seminar Series. This volume contains eighteen papers. The papers were presented by the academic staff of the Faculty during the 2016/2017 Session. In this volume, all the Departments of the Faculty have input in terms of paper presentation; this is very encouraging. Furthermore, most of the papers are from Master and PhD work of our staff who completed their study in the last five years.

I would like to encourage colleagues to continue to present seminar papers so that they can have the opportunity of getting inputs from members of the Faculty towards improving the quality of their research work and dissemination of their findings for the benefit of all.

We are most grateful to the ministry of **Rehabilitation, Reconstruction and Resettlement** under the able leadership of **Engr. Prof. Babagana Umara and Maiduguri Flour Mills** for their financial support towards the processing and publication of this volume. Your show of support to this faculty and indeed the university is recognized and appreciated.

I would like to thank everyone that made contribution(s) in this volume. The team is indebted to reviewers that helped to check the papers and those that came during the presentation so that the publication will meet the minimum acceptable standard, I thank you.

Finally, I would like to encourage participation in terms of paper presentation and attendance during faculty seminar presentations. If done with all enthusiasm, those saddled with the responsibility of steering the seminar series will be encouraged and better research work can come out of the Faculty. ASUU has made it clear, 'Publish or Perish'. I therefore wish everyone the very best in their chosen career as scholars and Teachers during their time in the academic world and beyond.

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## INSTRUCTION TO CONTRIBUTORS

Submission may be in form of full-length articles, (not exceeding) 8 pages, research notes, reports or book and paper reviews if required, (not exceeding) 8 pages. Authors should submit the original and one other copy of each manuscript, typed double-space on A4-size paper, single-sided and with at most one and half inch margin on all sides.

Each article must be accompanied by an abstract of not more than 200 words, which forms an intrinsic part of the article and not more than five keywords.

The name(s) and affiliation(s) of the author(s) should appear on the first page only.

Authors will be required to present the paper and be accepted by members before it can be processed for publication. Papers are accepted with the understanding that they have not been published or accepted for publication elsewhere.

### Citation/References

Use Harvard system of citation/Referencing. "References" should be listed collated at the end of the article and typed double-spaced, indented at 0.5, Hanging.

### Reference Style to Journal Articles

1. Aji, I. S. and Bakura, G., (2017) Staff Development Through Seminar Presentation; *Arid Zone Journal of Engineering, Technology and Environment*. Vol 14, p. 46 - 49.
2. Isuwa A.S., Grema K. and Kashim S. (2019), "Early Kanuri Vocabularies (1970 - 1820)", *Journal of West African Languages*, Vol. 5 (4) p20-30.

### REFERENCES TO CHAPTERS IN BOOKS OR MONOGRAPHS

Citations in the text should be in the names/Date form:

- i. Boka and Kaltum (1999) reported .....
- ii. .... as was recently reported (Hazard and Chelsea 2017).

If the citations refer to specific pages in the book or in the journal, those page numbers belong with citations in the text, and should be placed after the date, e.g. (Emeka and Onundi 1983:100).

### SECTIONS

Normally, major sections are captured as follows:

#### **Abstract**

#### **1.0 Introduction**

#### **2.0 Materials and Methods**

#### **3.0 Results and Discussion**

#### **4.0 Conclusion**

Sub-sections can be built under each major section and numbered appropriately in **sentence case** as the major section but not necessarily bold.

Reviews should make effort to group relevant work together and draw appreciable conclusion on way forward that will enable gaps to be seen with the view to further research on it. It's important that most recent research is reviewed to avoid reinventing the wheel.

**References in Monographs and Books:**

- i. Bakura, Ronald (2014), *The Kanuri of Borno*, Holt, Rinehart and Winston, New York.
- Chapters or Sections of edited Monographs:
- ii. Modu, Ronald (1999), "The Borno King List". In: Butler Jeffrey (ed), Boston University, papers on Africa: Vol. 2 African History, Boston University Press, pp. 85-105.

**ILLUSTRATIONS AND TABLES**

All Tables and Illustrations Should Be Numbered with Arabic Numerals, Titled and Cited in Text.

Each table should be self-contained and self-explanatory, even without reference to the text. Three to four horizontal lines be used to draw the table as the case may be (see example below).

Tables, Figures, Charts, Plates, etc. should be placed very close to where they have been mentioned and each discussed appropriately.

Tables should be numbered in the order they are referred to in the text, and should have a brief descriptive title, avoiding abbreviations, if possible.

Numbering of tables, figures, plates, equations should flow from the beginning to the end, not putting into consideration the section which it appeared in the paper, i.e. table 1....., table 10 etc; Fig. 1....., Fig. 10, etc.

**Table 10. Mechanical Sieve Analysis of Billiri and Damaturu Natural Sand**

Source	Depth (m)	GFN (AFS)	Color	Grain Shape
Billiri	0.5	162.35	Brown	Sub-angular
Billiri	1.0	148.42	Brown	Sub-angular
Billiri	1.5	99.30	Brown	Sub-angular
Damaturu	0.5	133.21	Dark-Brown	Sub-angular
Damaturu	1.0	88.05	Dark-Brown	Sub-angular
Damaturu	1.5	125.99	Dark-Brown	Sub-angular

Maps, Designs and figures should be quite clear, all line drawings, diagrams or graphs should appear in such a way that when printed in black and white, the difference in the information contain can be clearly seen when printed in black ink.

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