



***REPORT ON ACADEMIC ACTIVITIES OF NATIONAL  
MATHEMATICAL CENTRE ABUJA, NIGERIA(JANUARY 2016-  
APRIL 2017) AT THE 20th COMSATS COORDINATING  
COUNCIL MEETING 15-16 MAY 2017, CAIRO, EGYPT***

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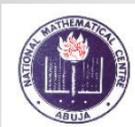
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# 1. INTRODUCTION

## 1.1. INSTITUTIONAL INFORMATION

The National Mathematical Centre, Abuja was established in 1989 by Decree No.40 which was repealed and replaced by the National Mathematical Centre ACT, CAP N58 of Federal Law of Nigeria 2004 .The Centre was established to amongst other to train and develop a high level of personnel in Mathematical Sciences, create a resource Centre for National and International Communities and provide for other ancillary thereto.

National Mathematical Centre is a Federal government Institution (An inter University Centre for Mathematical Sciences) saddled with the responsibility to develop appropriate initiatives and resources of international standing for re-awakening and sustaining interest in the mathematical sciences and their applications, and also as an adequate response to the dramatic decline in the production of teachers and specialists in the mathematical sciences comprising Mathematics, Mathematical Science Education, Statistics, Computer Science and

- Theoretical Physics.



### *Institutional information contd..*

National Mathematical Centre (NMC), Abuja is repositioning itself as a frontline player in Mathematical Modelling and Simulation. In the recent past, NMC hosted the second COMSAT International Thematic Research Group on Mathematical Modelling and Simulation meeting on 30<sup>th</sup> December 2015. This meeting followed the hosting of NMC-COMSAT-ISESCO International Conference on Mathematical Modelling on 28<sup>th</sup> - 29<sup>th</sup> December 2015. There was a NMC-RMDC Project on Mathematical Modelling of Raw Materials Processing Equipment which cumulated in the organisation of the first International Workshop on COMSOL software on July 31-August 6, 2016.



## **1.2 MISSION OF THE INSTITUTION**

Rekindling and sustaining interest in Mathematics and Mathematical Sciences and their applications at all levels of the Nigerian educational system, for national scientific and technological progress through the development of Mathematics, Mathematical Science Education, Statistics, Computer Science, and Theoretical Physics and the creation of an enabling environment favourable for speedy technological and industrial revolution by promoting appropriate manpower capacity building required for the growth process.

## **1.3 ROLE IN THE COUNTRY/REGION**

The functions of the Centre is as enunciated in the NMC ACT; CAP N58 that set up the Centre

## **1.4 VISION STATEMENT**

To become a world class Centre of excellence for research and training in the Mathematical Sciences capable of promoting the development and socioeconomic impact of Mathematical Sciences in Nigeria, as well as using mathematical Sciences to solve important scientific and technological problems



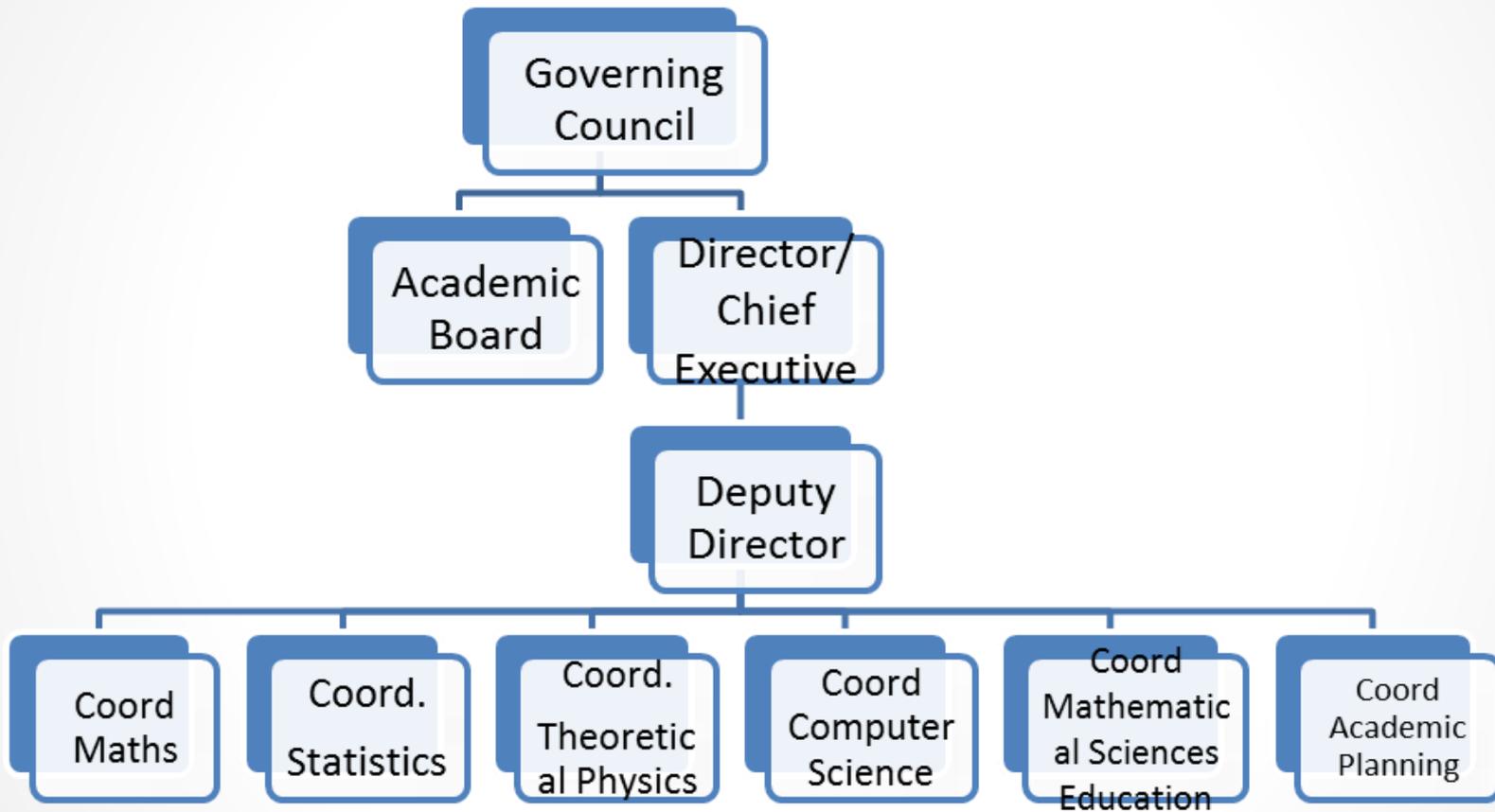
## 1.7 ACADEMIC BOARD

The Academic Board of the Centre is charge with organization and control of lectures and tutorials, symposia, workshops, conferences etc. in the subject areas of Mathematics, Statistics, Computer Science, Theoretical Physics and Mathematical Sciences Education. The broad subject area of Mathematics i.e. Algebra , Geometry, General and Global Analysis ,Topology, Approximation Theory, Computational and Applied Mathematics, Mathematical Modelling ,Operation research, Systems and Control Theory etc.; shall be given due attention. Similar attention are devoted to the usual key subject areas of the other Programmes. Its responsibilities also include the admission and discipline of participants who are admitted into the Centre to receive one course of instruction or the other.

The Membership of the Academic Board, as stated in part IV, section 10 of Decree No. 40 of 1989, comprises: the Director and Chief Executive of the Centre as its Chairman, the Deputy Director, the Librarian, four representatives drawn by the Centre in rotation from among the Universities in Nigeria in the discipline of Mathematical Sciences, and five other persons. The tenure for the appointments will be specified , by the Director of the Centre, with the approval of the Council.

The Academic Board is also expected to formulate and continuously evaluate the academic programmes of the centre, and perform other functions as are traditional to such bodies. The Director/Chief Executive is the Chairman of the Academic Board meetings; in his absence, the Deputy Director shall preside.

However, in the absence of both, the members present at any of such a meeting shall appoint one of their members to preside



*Organizational Structure of NMC*



## **HOW IS THE INSTITUTION FUNDED?**

Through subvention by Federal Government of Nigeria, sponsorship from private and public sectors in Nigeria and abroad. Internally generated funds through selling of instruction materials and Mathematics kits.

## **1.8 PRESENT STATISTICS OF THE CENTRE**

Number of employees (200)

Number of Scientists:

20 PhDs

58 M.Sc.

36 B.SC

Technical support staff 26



## **2. RESEARCH ACTIVITIES**

### **2.1 M.SC RESEARCH PROJECTS ON FINANCIAL MATHEMATICS**

Twenty-seven students have completed their M.sc Research projects and defended. The projects covered several areas of Modelling in the Financial Economics. Econometrics, modelling of behaviours of money and financial markets. The University of Abuja serves as the degree-awarding institution. It therefore, awards the degrees to the Students who have successfully completed the M.sc programme.

### **2.2 MATHEMATICAL MODELS FOR PRICING OF ELECTRICITY COMMODITY IN NIGERIA**

The Research project on Mathematical modelling for electricity tariff for electricity in Nigeria has been completed. Models for pricing, hedging, price sensitivity analysis and optimization of electricity have been developed. The need for the models was based on the request by the Nigerian Electricity Regulation Commission



## 2.3 ON-GOING RESEARCH

### 2.3.1 NMC-RMRDC Modelling Research on Raw Material Processing Equipment

The first phase of the project has been completed and NMC-RMRDC has signed a Memorandum of Understanding (MoU) with National Mathematical Centre on new directions for the project.

The Raw Material Research and Development Council (RMRDC) realised that one of the major reasons why most raw materials processing equipment tend to fail was because such equipment were not properly modelled, from the Mathematical point of view, before fabrication.

Engineers need to model the design for equipment, simulate the model to obtain adequate information on the operational characteristics of parameters of the equipment for its effectiveness and durability, so the Council rightly reasons. In view of this, RMRDC instituted a research grant on Mathematical Modelling of Raw Materials Processing Equipment which was domiciled at the National Mathematical Centre (NMC). The RMRDC provided the funds and NMC oversees usage of the grant. The grant is to complement project on design of Raw Materials processing equipment and the research will not be experimental but simulation in nature. The funds for this phase is yet to be released.



The expectations from the recipients of the award were:

1. The project must be targeted towards Raw material processing equipment and to develop mathematical models/simulation that would determine the optimal operational characteristics (parameters) for the equipment.
2. Use the models to predict the best way to operate the raw material processing equipment in order to optimize its performance and life expectancy of the equipment.
3. Carry out additional investigation to identify other factors that may potentially affect the machine with the view to proffering solution using mathematical modelling techniques.
4. Quarterly, the awardee is expected to present seminars and send progress report on work to the project Manager.

The awardees of NMC-RMRDC Modelling Research grants that have completed their projects and reports submitted.





## **PROJECT ON MATHEMATICAL MODELLING AND SIMULATION OF AIR AND WATER POLLUTION: EFFECTS AND REMEDIES.**

The project completed and NMC-RMRDC has signed a Memorandum of Understanding (MoU) with National Mathematical Centre on new directions for the project.

The project is being carried out by the COMSATS International Thematic Research group on Mathematical modelling under the leadership of Prof. B O Oyelami. The project was specifically designed to determine to what extent the pollution in air and water will have impact on agricultural production, human health and global ecology and economy of South-South including the possibility of substantial population displacement because of pollution in the region. Come up with some effective models for predicting/ controlling pollution of air and water. Provide intellectual resources to the Environmentalists, Educationalists, Researchers, Students and field workers to understand the effects of air and water pollutions and possible ways of controlling pollutions. The Activities of group will be reported in the report of ITRG on Mathematical modelling.



## **POLLUTION: EFFECTS AND REMEDIES**

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### **2.3.3 NATIONAL THEMATIC RESEARCH GROUP ON MATHEMATICAL MODELLING (NTRG)**

The National Thematic Research group on Mathematical modelling (NTRG) are working on Mathematical Modelling on Climate change and Environmental problems. We expect the group to submit their report findings in the next stakeholders' meeting at NMC in November 2018.

### **2.3.4 RESEARCH AND TEXTBOOK WRITING PROJECT**

National Mathematical Centre is in the process of disbursing Research and Book writing grants to the Scientists in the Centre. The research grants are for individual researchers at the Centre working on interdisciplinary research problems

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### **3. TRAINING (CAPACITY BUILDING) ACTIVITIES**

#### **3.1. NMC Graduate Foundation Course**

The NMC Graduate Foundation course is a 12-Week programme and subjects covered were in the area of Abstract Algebra, Linear Algebra, Geometry Topology, Real Analysis, Number Theory, Differential Equations and Functional Analysis.

Qualification: BSc Degree in Mathematics, Physics, Computer Science with a minimum of 2nd Class (Upper Division). A candidate employed in a Nigerian University or any other tertiary Institution is an added advantage.

#### **3.2 3-day International Symposium on Mathematical and Statistical Finance**

This event was organised jointly by the National Mathematical Centre Abuja and the University of Ibadan, Nigeria. The programme was held on 1-3 September 2016 at the University of Ibadan. This specialist symposium on mathematical and statistical finance brings together Nigerian and International academics, students and professionals, working on topics in financial mathematics, statistical finance, empirical finance, and financial engineering research, associated with financial markets, stock market Characterization and development, economic policy and development.

These topics are underpinned by macroeconomic, monetary and fiscal policies, and refracted on the lenses of emerging applications in **bank financial management**.



### 3.3 CAPACITY BUILDING WORKSHOP FOR MATHEMATICAL SCIENCES LECTURERS

The Centre (NMC), Abuja organized a Capacity Building Workshop for Mathematical Sciences Lecturers in Tertiary Institutions on The Teaching of Mathematics and Statistics.

*The theme was “Improving the Capacity of Mathematical Sciences Lecturers on Teaching and Research”.*

The Workshop started on 21st October, 2015 and 25th October, 2015.

The main objective of this workshop was to create opportunity for the Lecturers of Mathematical Sciences in tertiary institutions to acquire more teaching skills through exposure to basic concepts and Strategies for modern teaching.

Specifically, the objectives of the workshop were to:

- (i) Identify basic principles of modern teaching in the Mathematical Sciences.
- (ii) Updating Lecturers with knowledge of basic concepts in Mathematical and Statistics at the tertiary Levels. and
- (iii) Improve their skills in carrying out research activities in the Mathematical Sciences.



### **3.4. ASS-AMU SYMPOSIUM**

The African Academy of Science (ASS) and the African Mathematics Union (AMU) symposium was held on 17th -20th May 2016. The theme of the symposium being “Current Research Trends in Mathematical Sciences and Applications”. This scientific activity will jointly be organised by ASS- AM-NMC UNESCO Chair of Mathematics, National Mathematical Centre (NMC), Abuja Nigeria, UNESCO, Twinning and University Networking.

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### **3.5 1<sup>ST</sup> PASTOR E. A. ADEBOYE ENDOWED CHAIR ENRICHMENT TRAINING WORKSHOP IN APPLIED MATHEMATICS**

Held in the University of Lagos in Collaboration with National Mathematical Centre, Abuja i organised the 1<sup>st</sup> Pastor E. A. Adeboye Endowed Chair Enrichment Training Workshop in Applied Mathematics. The programme was held from 5<sup>th</sup> to 11<sup>th</sup> June, 2016 with the theme ‘Complex Fluid flows and it's Environmental Applications’.



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### **3.6 Workshop on Fundamental of Statistics Skills for Postgraduate Research (for Postgraduate Students, Researchers and Lecturers).**

Held at the National Mathematical Centre Abuja on 19-25 June 2016. 25 Participants attended.

### **3.7 Workshop on Computer Driven Data Analysis I.**

Held at the National Mathematical Centre Abuja on 24-30 July 2016. 35 Participants attended.

### **3.8 Workshop on Computer Driven Data Analysis II.**

Held at the National Mathematical Centre Abuja on 21-27 August 2016. 25 Participants attended.

### **3.9 1st International Workshop on COMSOL Multi-Purpose Modelling Software,**

Held at the National Mathematical Centre Abuja (July 31-August 6, 2016), 85 participants attended.



## 4 TALENT HUNT AND DEVELOPMENT ACTIVITIES

### 4.1 The 9th National Mathematics Competition for University Students (Namcus 2017)

The competition was held at the National Mathematical Centre Abuja from Sunday 01 April, 2017 to Thursday 06 April, 2017. 35 Universities participated.

### 4.2. National Biology Olympiad (IBO) Competition

The third round of IBO was held 5th -9th April 2017 at National Mathematical Centre Abuja.

### 4.3. Olympiad Examinations

The first round of Olympiad examination was held at all state capitals of the Federation on the 27th of November, 2016.

### 4.4 Olympiad 2016 Final Training and Selection

The Olympiad 2016 Final Training and selection was held on 25th March 2016.  
Physics

### 4.5 National Biology Olympiad (NBO)

The National Biology Olympiad (NBO) conducted international biology Olympiad (IBO) in Vietnam (Hanoi) in July 2016.



## **5. OUT-REACH ( AT NATIONAL) ACTIVITIES**

### **5.1 NMC/ SDGS Mental Arithmetic and MIP Training**

The Centre organized a 2-week MDGS Mental Arithmetic and MIP Training workshop that held from the 7th to 18th December, 2016. This workshop took place simultaneously in 3 states of the federation namely Jigawa, Kano and Katsina States. In each Centre 240 students and 24 teachers were trained.

The programme was divided into 2 sections, Mental Arithmetic which took place in the morning and Mathematics which held in the afternoon. The Mental Arithmetic training exposed participants to the use of the Chinese abacus to perform addition and subtraction. The Mathematics training showed Teachers and students different methods of teaching and learning mathematics respectively with the use of teaching aids. In Jigawa state the training took place at Dutse International Model Secondary School, Shuwarin Express Way, Dutse. While in Kano the venue was Runfa College, BUK road, Kano.

The venue for the training in Katsina state was Education Resource Centre Katsina.

### **5.2 NMC/SDGS Training**

The nationwide National Mathematical Centre /States Development Goals on Mental Arithmetics and Mathematics Improvement Project on Training is going on in 5 South East states in Nigeria (29th March -5th May 2017) .The training for 6 North Central States and the 7 North-West States already completed in 2016. ●



## 6. INTERNATIONAL COLLABORATION

Collaboration with international organisations and private sector

1. UNESCO-NMC CHAIR on Mathematics (Algebra): The United Nations Education Scientific Cultural Organisation (UNESCO) approved the establishment of the UNESCO/UNITWIN chairs at the National Mathematical Centre, Abuja. The approval was conveyed by UNESCO in March 2015 and an Agreement was signed.
2. African Academy of Science (ASS) and African Mathematics Union (AMU): NMC collaborated with ASS and AMU for purposes of hosting some scientific activities and competitions for young talented students in the Olympiads. NMC had successively hosted the first African Academy of Science Olympiads (PASO) in 2015 and had received the go ahead to host the NMC-ASS-AMU International Symposium on Current Research Trends in the Mathematical Sciences and its Applications which was hosted on May 3-20, 2016.
3. NMC Diaspora Visiting Scientists programme: This programme allows Nigerians and Africans scientists to visit Centre for under three or six months. The NMC would pay them salary for the period. The programme was such that whenever they were on sabbatical they would be in Nigeria.



4. NMC- Carnegie Africa Programme-Professor Nkechi will be visiting NMC under Carnegie Africa Visiting Scientists programme in May 2017.
5. COMSATS Institute of Information Technology (CIIT), Islamabad, Pakistan for training of Nigerian Postgraduate students.
6. International Bebra Challenge Organisation for Informatics and Computational Thinking at Pre-tertiary level. National Mathematical Centre is the official Representative of Nigeria.
7. National Collaborations: NMC has collaboration with many Nigerian Universities on Science, Technology and Mathematics. The Centre also collaborated with several Research Centres under Ministry of Science and Technology; Ministries of Aviation and Water Resources, etc. Here are some other Agencies:
  - The Raw Material Research and Development Council (RMRDC) with Research on Modelling of Raw Material Processing Equipment.
  - National Atomic Energy Commission, Abuja, Nigeria for provision of facilities for hosting some of scientific events.
  - Shelda Science and Technology Complex (SHETCO) for partnership in some areas of Research with common interest.
  - National Information and Technology Development (NITDA) to develop local capacity in Research and Software Development.
  - ▪ NCC, National Communication Commission to develop internet connectivity of the NMC and provide necessary infrastructure.



## 7. COMMERCIALIZATION/ PATENT OF RESEARCH

The National Mathematical Centre is intensifying development of more new Mathematical kits and Whiz Teachers' software .Patenting and Commercialization of the dual is being carried out by the NMC Global Consult the commercial unit of NMC.

## 8. PUBLICATIONS

- Brief on National Mathematical Centre, Nigeria was published together with the NMC Books and Proceedings, 2016.
- The Vol.5 of NMC Mathematical Sciences Journal published in 2016.
- The Vol.5 of NMC Mathematical Sciences Education Journal published 2016.



## 9. FUTURE PLANS

The Director/Chief Executive of National Mathematical Centre (NMC) Abuja, Professor Ejugwu Stephen Onah critically studied the Centre's mandate and made due consultations with the Management and Staff of the Centre and stakeholders in the Mathematical Community in Nigeria, Federal Ministry of Education and the National University Commission (NUC). A 5-year developmental plan was developed for the Centre. Five areas of priorities were identified as stimuli for sustainable development of the Centre and these are: Academic Development, Staff Development, Information and Communication Technology (ICT) development, Physical Infrastructure Development and Revenue Mobilization.

The resources and programmes of the Centre would be prioritised along these areas during this medium time developmental period.

The Centre intends to implement the developmental plan for sustainable development together with the following auxiliary plans:

1. Have a simulation laboratory with supercomputer facilities.
2. To consolidate our collaboration drive by extending our reach to more Organisations.



## PRAYERS:

1. Financial Support to host an international conference in Mathematical Modelling and Simulation/Computational Mathematics.
2. Financial Support in the area of travel grants for Scientists and Researchers from outside Nigeri.
3. NMC is in the process of conducting training of Graduate Assistants and Assistant Lecturers in the Nigerian University System in the area of Pure Mathematics with a view to encouraging them to go for M.Sc. degree programmes at CIIT and possibly Ph.D subsequently. This new approach on the target audience is expected to attract more candidates for the programme. The NMC is soliciting the COMSATS Organisation to be ready and willing to accommodate more candidates from Nigeria. The NMC is also requesting that prompt dissemination of information on admission process is made available to the Centre.

Thank you for giving me audience.