

## EVALUATION AND ACCREDITATION DOCUMENTS

### M.Sc. Mechanical Engineering

Africa Centre of Excellence in New Pedagogies  
on Engineering Education (ACENPEE)

Ahmadu Bello University

Zaria, Nigeria

**June 2024**

Rapport publié le 12/07/2024

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## EVALUATION REPORT

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**March 2024**

The Ahmadu Bello University has mandated the Hcéres to perform the evaluation of its Mechanical Engineering M.Sc. programme. The evaluation is based on the “External Evaluation Standards” of foreign study programmes, adopted by the Hcéres Board on 31<sup>st</sup> January 2022. These standards are available on the Hcéres website ([hceres.fr](http://hceres.fr)).

On behalf of the experts committee<sup>1</sup> :

Olivier Boutin, President of the committee

In the name of Hcéres<sup>1</sup> :

Stéphane Le Bouler, Acting President

<sup>1</sup>In accordance with articles R. 114-15 and R. 114-10 of the Research Code, evaluation reports are signed by the chair of the experts committee and countersigned by the President of Hcéres.

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## I. STUDY PROGRAMME IDENTITY SHEET

- University: Ahmadu Bello University (ABU), Zaria, Nigeria
- Department concerned: Department of Mechanical Engineering
- Title of the programme: MSc Mechanical Engineering
- Year of creation and context: 1968. The Faculty of Engineering of ABU is the oldest in Nigeria. It started in 1955 as a Faculty of Engineering of the University College, Ibadan. In 1962, the University took over responsibility for the Faculty of Engineering Education and the Faculty of Engineering in Ahmadu Bello was born. Postgraduate studies in the Department of Civil Engineering started in the late 1960s, with the first set graduating in 1968.
- Site where the programme is taught (town and campus): Department of Mechanical Engineering, Campus Samaru, Ahmadu Bello University (ABU), Zaria, Nigeria

### PROGRAMME DIRECTOR

- Surname, first name: Afolayan, Matthew Olatunde
- Profession and grade: Associate Professor
- Main subject taught: Mechanical Engineering

### METHODS AND RESULTS OF THE PREVIOUS ACCREDITATION(S)

- In 2022, the programme was evaluated by the National Universities Commission (NUC). The programme received its full accreditation by the NUC for 5 years, from March 2022 to March 2027.
- No previous international accreditation. Three other programmes from the ACENPEE (MSc Civil Engineering, MSc Chemical Engineering and MSc Water Resources) are being evaluated by Hcéres in 2023.

### HUMAN AND MATERIAL RESOURCES DEDICATED TO THE PROGRAMME

#### – Human resources

Academic staff	Professors	Associate professors	Assistant professors	Lecturer	Total
		<b>7</b>	<b>5</b>	<b>9</b>	<b>1</b>
Technical staff					Total
					<b>23</b>
Administrative staff					Total
					<b>9</b>

- **Material resources:** computer lab, smart classrooms, open access and subscribed data bases, video conferencing applications (Zoom, Skype, and Google Meet), learning management devices, lecture theatres, laboratories (soil mechanics, structural mechanics, material characterisation, hydraulic, etc), workshop (welding and fabrication, machine tools, carpentry, electrical), Central University Library, the Department has a functional physical Library. There is also a collection of e-books and other relevant publications. There is an e-library at the Central University Library with a large collection of current e-books, journals, patents, theses, dissertations, etc. The Central University Library has procured access to eleven commercial databases.

## STUDENT POPULATION: EVOLUTION AND TYPOLOGY OVER THE LAST 4 YEARS

		2018/2019	2019/2020	2020/2021*	2021/2022	2022/2023*
<b>Enrolment</b>	Male	50	31	-	30	-
	Female	1	2	-	2	-
	<b>Total</b>	<b>51</b>	<b>33</b>	<b>-</b>	<b>32</b>	<b>-</b>
	<i>including foreigners</i>	0	0	-	5	-
<b>Graduates</b>	Male	4	17	-	13	-
	Female	1	2	-	3	-
	<b>Total</b>	<b>5</b>	<b>19</b>	<b>-</b>	<b>16</b>	<b>-</b>
	<i>including foreigners</i>	0	0	-	0	-

\* Due to Covid-19 pandemic and industrial action embarked by Academic staff of Nigerian universities, Ahmadu Bello University had to cancel two academic sessions (2020/2021 and 2022/2023), as such, no admission within these specified periods.

## II. COMPOSITION OF THE EXPERTS PANEL

- **Olivier BOUTIN**, Chair of the panel, Full professor at Aix-Marseille University, France
- **Ali DAOUADJI**, Full professor, INSA Lyon, France
- **Demba DIALLO**, Full professor, Paris-Saclay University, France
- **Maxime LEBRETON**, Ph.D. student, ENS-PSL Paris, France

Hcéres was represented by **Zakia MESTARI**, project manager, Europe and International Department.

## III. VISIT DESCRIPTION

- **Date of the visit:** the visit took place on Tuesday 5<sup>th</sup> December 2023.
- **Summary of the proceedings:** before the visit took place, the self-evaluation report and numerous appendices had been received by the experts. Two preparatory meetings between the Director of the Hcéres Europe and International Department, the project manager and the panel of experts were held in Paris (13<sup>th</sup> November) and online (29<sup>th</sup> November). The on-site visit took place during one day, according to a schedule agreed between the ACENPEE, the NUC and the panel. During the visit, the experts asked for a few more documents to get quantitative data. All of these documents have been received.
- **Organisation of the visit:** for safety reasons, the visit was organised in hybrid mode in Abuja and the panel was not able to visit the Centre in Zaria. The Centre leaders, the programme director and the postgraduate coordinator of the Ahmadu Bello University met the panel in Abuja, as well as some students and academics.
- **Cooperation of study programme and institution to be accredited:** ACENPEE has been cooperative throughout the process. The self-evaluation report was sent according to the agreed schedule. The questions asked before and during the visit were answered clearly and precisely. The panel is satisfied that the conclusions reached are based on relevant and available information. Moreover, the implication of the National Universities Commission has been very helpful throughout the process.
- **People met:** the experts' committee was able to meet with 39 people from different panels:

	Session	Audience
8:00 – 9:30	Presentation of the programme and discussion	Centre Leaders, programmes directors and their teams
9:30 – 10:30	Academic staff	Representative panel of academics from both programmes

10:45 – 11:45	Quality assurance	Quality assurance representatives
11:45 – 12:45	Alumni	Representative panel of alumni
14:00 – 15:00	Socio-economic partners and employers	Representative panel of socio-economic partners and employers
15:00 – 16:30	Students	Representative panel of students from both programmes
16:30 – 17:30	Closing session	Centre Leaders, programmes directors and their teams

## IV. PRESENTATION OF THE STUDY PROGRAMME

### 1 – PRESENTATION OF THE STUDY PROGRAMME

The Centre for New Pedagogies in Engineering Education is an Africa Centre of Excellence hosted by Ahmadu Bello University in Zaria, Nigeria, implemented as part of the ACE Project supported by the World Bank in 2019. The Centre was established to enhance engineering education by experimenting with new teaching methods, developing curricula and moving those findings into the classrooms of tomorrow's engineers, in order for them to respond creatively and responsibly to 21<sup>st</sup> century challenges. Therefore, its stated mission is to provide a world class teaching and learning environment to promote innovation in techno-pedagogical skills and competencies for engineering education and practice. Several programmes are hosted in the Centre, such as Mechanical Engineering, Chemical Engineering and Environmental Engineering.

To meet the needs of Agricultural and Bioresources equipment, Metallurgy and materials aspects of Engineering, the Department of Agricultural Engineering as well as the Department of Metallurgical Engineering were developed into a fully-fledged department out of Mechanical Engineering Department. In 1987 the Federal Ministry of Industries initiated a project on low-cost vehicles and this Department was among the six centres in the country. The Centre for Automotive Design and Development (CADD) started in the department and was later recognised as a Research Centre in 1992. In 2016, NUC approved the commencement of two additional programmes under the Department namely: Mechatronics and Automotive Engineering to meet the challenges in Robotic design as well as automotive industries.

Currently the Department is running post graduate programmes in various sections including Postgraduate Diploma, Master and Ph.D. The postgraduate programme is structured into three areas of specialisation: Mechatronics and Mechanical Engineering with options in Production Engineering and Energy Studies. The programme is a four semesters (two-years) degree post Bachelor's degree programme and it leads to the award of Master of Engineering degree. The curricula are founded on a solid base in The basic sciences of Mathematics, Chemistry and Physics and in Production Management, Quality Control, Reliability & Ergonomics and Numerical Modelling.

### 2 – PRESENTATION OF THE PROGRAMME'S SELF-EVALUATION APPROACH

The Faculty of Engineering has a committee on quality assurance which comprises one member from each of the departments. This member is the quality assurance officer of the Department and Chairman of the Departmental quality assurance committee, comprising three members. The submitted self-evaluation report was very rich, with a lot of appendices (402 pages) providing qualitative and quantitative data. A few additional documents were requested and all of them have been received within the week.



## V. EVALUATION REPORT

### 1 – TRAINING POLICY AND CHARACTERISATION

**The M.Sc. programme is perfectly in line within the institution strategy and is hosted by the Mechanical Engineering Department in the Faculty of Engineering of Ahmadu Bello University.** To meet the needs of Agricultural and Bioresources equipment, Metallurgy and materials aspects of Engineering, the Department of Agricultural Engineering as well as the Department of Metallurgical Engineering were developed into a fully-fledged department out of Mechanical Engineering Department. In 1987, the Federal Ministry of Industries initiated a project on low-cost vehicles and this Department was among the six engineering centres in the country. The Centre for Automotive Design and Development (CADD) started in the Department and was later recognised as a Research Centre in 1992. The Mechanical Engineering Programme at Ahmadu Bello University, Zaria, is dedicated to producing top-quality mechanical engineers and advancing research in the field. This programme is one of the first programmes in this field in Nigeria. It is clearly dedicated to local and national productions and Mechanical Engineering. 12 other universities are identified at the national level with a similar programme. Within Ahmadu Bello University, the programme is developed in a coherent and complementary manner with programmes in the same academic cycle (chemical engineering, civil engineering, biology, water resources, etc.).

**The academic partnerships are very well identified at the local (6 research laboratories), national (4 research laboratories), complementary in terms of research topics, and relevant with the programmes.** Students can perform practical works and research activities within the laboratories of the Department. Moreover, the equipment available in the Heavy Structures and Concrete Lab belonging of the Civil Engineering Department are used to perform mechanical testing. They have informal relationships with other laboratories in Nigeria. These laboratories are complementary to their own activities, as for materials characterisation and analyses for instance. To use the laboratories, students are only required to submit a letter from their Master's supervisor, detailing the research purpose of their visit.

**It is stated that the Department possesses laboratories in all core areas and specialisations.** The endowed Shell Professorial Chair in Mechanical Engineering has contributed to positioning the Department in an enviable datum. The postgraduate programme (as well as a Ph.D.) is structured into three areas of specialisation: Mechatronics and Mechanical Engineering with options in Production Engineering and Energy Studies corresponding to the areas of expertise of the teachers and researchers. In the programme, the contributions of multidisciplinary and interdisciplinarity are well identified with some courses on Microcontrollers and embedded systems or Industrial Instrumentation and Control, Finite Element Analysis of Structure, Fluid Mechanics, Solar Energy, as well as Research Methodology and Engineering Law, Management & Entrepreneurship. Moreover, there are numerous exchanges between the different Departments of the Faculty of Science, for instance for joint supervision of research projects, leading to strong interdisciplinarity. There is no dedicated course on sustainable development, but some aspects are embedded within other courses: the Introduction to Renewable and Unconventional Methods of power generation, for instance, depicts different types of unconventional energy (Hydropower generation, Wind Power generation, Biomass Energy and Conversion).

**International partnerships exist with the University of Toronto, Canada and a MoU is signed with the Central South University (China) at the Ahmadu Bello University level for training purposes for the students and staff exchange.** Only two students were able to benefit from outgoing mobility, one at the Australian National University, Australia and one at the Stellenbosch University, South Africa. No information is provided concerning incoming students.

**The M.Sc. programme comprises a one-year minimum mandatory research project conducted under the guidance of two confirmed researchers.** For two years, each M.Sc. student must propose three scientific seminars open to all M.Sc. students and Ph.D. students. This research project is defined and defended during the second semester of the first year and is running during the second year. Final presentation and validation are made in front of at least one external and two internal examiners. The list of academic staff is provided in the Postgraduate Students' Handbook and indicate that all Professors are specialised in areas connected to the programme curriculum (Mechatronics Engineering, Production Engineering and Energy & Thermo-Fluids) and that most of them have an effective research activity leading to high track-records. There are three research groups, one for each specialisation. There is a full matching between teaching and research activities. The supervision ratio (the number of students divided by the number of teacher) is equal to three which is very low, and allow a high-level of hosting, together with the available rooms and equipment. The relevant supervisors for each research projects of the students are straightforward. A common room open to M.Sc. students is available within the Department.

**Research integrity and ethics are fully-developed and considered an important objective, as evidenced by documents at the Ahmadu Bello University level (details are given on recruitment procedure, staff integrity, scientific publication management, etc.).** However, it seems that there is no direct training on research integrity and ethics at the students' level, even though these aspects are embedded in most courses. A course is dedicated specifically to Research Methodology, compulsory for all M.Sc. students. Moreover, the research-based learning and courses on research methods proposed in the curriculum is available through the Central University Library and a library located in the Department. The University also provides access to Elsevier and ScienceDirect journals and book-chapters databases, and to an e-library with collections of e-books, journals, patents, etc.

**The study programme considers socio-economic needs, as the different courses are oriented on actual and future socio-economic challenges linked to Production, Energy and Mechatronics.** Courses about "Material Selection and Costing" and "Laboratory Practical" are offered but the overall programme is theoretically focused; a more practical and problem-solving approach could be introduced. Seminars and webinars implying external contributors are proposed. As defined in the Learning and Teaching Policy document, the University, through its institutes and Centres, provides opportunities for continuing education through postgraduate programmes, certificate programmes, and professional development courses. This helps teachers to stay updated with the latest developments in the field and enhance their teaching skills. Moreover, academic and technical staff are welcomed in companies for training on new equipment or software for free. This is made possible by the Alumni who are proactive with the Department. Most of the existing partnerships between the programme and companies engaged in an activity related to the programme are informal partnerships (e.g. Mother Cat Limited, Sunseed Nigeria Limited or Matrix Limited Fertilizer Plant). Some partnerships exist with seven national companies. Numerous companies are taking advantage of the equipment available in the research lab and, therefore, contract with the Department. These numerous partnerships demonstrate the attractiveness of the programme for socio-economic partners. They can provide regular seminars or webinars, online or on-site, to present their company and the job opportunities available in them. All students belonging to the ACENPEE programme receive a scholarship. Financial support can also be provided by Tertiary Education Trust Fund (TETFund), Raw Materials Research and Development Council (RMRDC) and the Higher Education Partnerships in Sub-Saharan Africa. At Ahmadu Bello University, students are trained to prepare for their job integration at undergraduate level during the six-month industrial training of the B.Eng. Post-graduates are only prepared for labour-market integration through the Alumni social networks or during discussions at the end of the seminars or webinars.

**In conclusion, the programme of M.Sc. in Mechanical Engineering is perfectly in line with the University strategy as well as the socioeconomic needs. Indeed, this M.Sc. is perfectly integrated and complementary to other programmes of the Faculty of Engineering of the University. The programme addresses the challenges associated with Production, Mechatronics, and Renewable Energy in a comprehensive and engaging manner. The programme proposes longstanding partnerships with research and socioeconomic actors at both the local and the national levels. The required facilities (equipment, library, software) for research are available. The environment is favourable for the students to develop their one-year research project. More national laboratories complement their research needs, as for material characterisation purpose for instance (Shell Office Lab. or Umaru Musa Yaradua University Central Lab).**

**These students can pursue a Ph.D. within the same Department. It would be interesting to add core courses on ethics and research integrity. There are well-established links with the socio-economic partners through several effective partnerships with public institutions and private companies, which present a real added value to the programme. MoUs have been signed at the University level, allowing outgoing mobility with foreign universities. These international exchanges could be improved in particular regarding incoming foreign students.**

## 2 – PEDAGOGICAL ORGANISATION OF THE STUDY PROGRAMME

**A Postgraduate Students' Handbook is available in the Department of Mechanical Engineering, stating clearly the objectives and contents and the Post Graduate Programme.** A detailed curriculum is provided, showing the different core courses with a comprehensive description of the contents. The M.Sc. programme is a four-semester full-time study. The first two semesters consist of formal lectures supported by laboratory work, studio practices, seminars and case studies. On successful completion of the course work, students are assigned individual research work under the guidance of two supervisors. At the end of the programme, they are required to submit a satisfactory dissertation on the assigned research area. The third and fourth semesters are dedicated to the Research Project. A notebook is given to students, emphasising the skills that are to be acquired during this research project. The programme structure enables the progressive specialisation of students, with core courses on basics in mechanical engineering during the first semester (first year), followed by elective courses during the second semester in each of the three specialisations: M.Sc. Mechanical Engineering (Production), M.Sc. Mechanical Engineering (Energy Studies) and Mechatronics. The second year is dedicated to students defining and drafting their research proposal, as well as actively participating in and attending seminars.

General knowledge and skills to be acquired are indicated in a useful Handbook of studies. Moreover, the program provides students with a notebook for their research project. This notebook includes a list of various skills that students are expected to acquire throughout the project, including academic, technical, and communication skills.

**Conventional teaching methods are proposed in the programme which combines formal lectures supported by laboratory work, studio practices, and seminars.** Technical staff are running experiments for the whole group and then they are subdivided into small groups for the students to perform the experiment. The number of practical work dedicated to industrial concerns is low and should be increased. For the promotion of students' success, there is at the University level a Guidance and Counselling Centre to assist students. An orientation service is proposed by the Postgraduate School. It would be interesting to offer more formal training on these aspects. Tutoring is made possible during tutorials activities as well as individual mentoring support during research project allowing to foster students' success. Two supervisors guide the students during the two years of the M.Sc. programme, providing assistance and support for their research projects. Each student is required to maintain an individual notebook to document their progress. Additionally, monthly oral presentations provide students with an opportunity to showcase their progress and discuss any personal or professional difficulties they might be facing. Online courses are given. Regular internet connection issues have been reported: it is recommended to record these online courses and to make them available to students. A database could therefore be created, and videos would be valuable even for students who have been successfully followed and/or in person attended the courses but did not fully took benefit of them. Blended (or hybrid) courses are set up within the Department and a full section of the Learning and Teaching Policy document (Online and Blended Teaching and Learning) defines the different methodologies and describes its implementation. Students have the opportunity to use information and communication technologies as a computer room is available for them during daily hours in the weekdays. Software licences are provided either at the University level or at the Faculty or Department levels for specialised software. Therefore, the use of information and communication tools exist and are embedded during the coursework period and during the research project.

**Students are asked to give several oral presentations during the M.Sc. in front of their supervisors and classmates.** This training seems to be favourable for being proficient in English and for using the relevant technical words for job-market integration. The needed skills are not explicitly taught but they are implicitly provided. English is the national language in Nigeria and no other language is taught to students. A programme is established at the University level for incoming foreign students and a dedicated training programme in English is proposed during six months before starting the M.Sc. programme.

**Concerning the Entrepreneurship content, the description provided in the Curriculum is vague, as it indicates "Relevant topics on entrepreneurship designed by the National Universities Commission for Nigerian Universities".** There is a common course in the PG programme in Mechanical Engineering: "Engineering Law, Management and Entrepreneurship". Alumni and professionals from companies having partnerships with the Department have the opportunity to present their work and related skills during seminars. A one-month (at least) internship in a private company is mandatory for students selected in the ACENPEE programme. The companies are selected and provided by the programme and validated by the World Bank. Even though seminars and workshops are sometimes provided by socio-economic partners to students, it appears important to give more formal possibilities to students to acquire labour-market-relevant skills.

**In conclusion, the curriculum of the M.Sc. programme is consistent and set out in a comprehensive manner. Students attend core and electives courses required in Production, Mechatronics and Energy Studies, based on dedicated and well-organised courses. Interdisciplinarity and multidisciplinary are proposed through courses available in other Departments of the University. The expected knowledge and skills are well-defined and help to address society's main challenges. The teaching methods are diversified even though online courses are rare. A one-month internship is mandatory for ACENPEE students' programme, which is insufficient even though they have already completed a six-month internship during the B.Eng. programme. A research project running for two years mixing practical and theoretical works is proposed. Formal lectures supported by laboratory work, studio practices, seminars and case studies constitute the framework of teaching in the Department. Partnerships with foreign universities have been signed and have benefited to two students for an outgoing mobility but international opportunities are mainly available to students thanks to Alumni through social networks, even though a global approach is given by the Policy Assurance Committee at the University level. Even if partially addressed, additional skills relevant to their job-market integration might be more formally proposed to the M.Sc. students. The acquisition of language skills required for a good job-market preparation and integration is implicit within the programme and not clearly proposed.**

### 3 – ATTRACTIVENESS, PERFORMANCE AND RELEVANCE OF THE STUDY PROGRAMME

**At the University level, a Learning and Teaching Policy is available, which proposes guidelines for monitoring the evaluation admission and examination processes, the procedure for the recruitment of appropriately qualified academic staff, the evaluation of students and teachers.** The number of applicants to the programmes is not provided. However, data concerning the enrolment in terms of total number, gender, nationalities and grants or bursaries are provided. It appears that the number of applicants has slightly decreased (from 51 at the beginning of the evaluation period 2018/2019 to 32 at the end) but remains stable while the number of foreigners has increased (from zero to five). The number of female students is very low (one or two per year) and the students with grants or bursaries increased from one to 16 and even 28 in 2019/2020). Same type of data is provided for graduate students: four at the beginning of the period to 13 with a peak at 17. None of the foreigners have been graduated. The success rate was 10% and reached 50%.

**Because of the security situation and industrial actions, and as many students are self-funded, most students add two or three semesters to graduate, especially if they are part-time workers.** This delay leads to a high number of students in the second year of graduation as they were 147. Among the graduate students, five have proceeded for further studies, 13 are employed (zero self-employed) and eight are not employed. It is recommended to monitor the success rate and think about potential solutions, such as increasing the number of grants, to improve their success.

**In conclusion, the attractiveness of the programme is monitored. The number of enrolled students is adequate compared to the hosting capabilities. The monitoring process is not detailed. However, the number of foreigners hosted in the programme is increasing. A survey as a tool for assessing the M.Sc. programme exists at the Department level to comply with the Policy of the University and results should be sent to the Quality Assurance Committee which in turn, gives recommendations to the Head of Department. The job-market integration monitoring highlights a good integration of the graduates mainly in the economic sector or in Ph.D. programmes, but the number of unemployed is high. Modern social media are also used by the programme to stay in contact with graduates.**

### 4 – ACADEMIC PROGRAMME MANAGEMENT AND CONTINUOUS IMPROVEMENT

**The role of everyone involved in the management of the programme is clear, and a strong degree of subsidiarity is shown.** Each member of the administrative staff, technical staff and academic staff is led by a clearly identified person acting under the authority of the Head of Department. The Department's organisation, the objectives of the postgraduates' programme and the staff list are all included in the Department Postgraduate Handbook, which is available to all students. There are several councils and boards in the Institution namely the Departmental Postgraduate Board, the Faculty Postgraduate Board and the School of Postgraduate Studies Board. There are three Quality Assurance Committees one at each level (Institution/Central, Faculty and Department). The roles, members and frequency of meeting are clear. There are identified academic officers within the Department as, for instance, the PG coordinator, the PG Examination Officer, the PG Seminar coordinator and the PG Lecturers. The registration and the examination procedures are clearly defined and transparent; they are available for students as a PG Handbook. The Handbook outlines the minimum credits that students must obtain during the first year, and it also provides detailed information about the entire process, including regular meetings, seminars, and the thesis defence. External contributors present seminars that are closely linked to the programme, providing insights into applying knowledge to case studies. Academic staff, especially assistant lecturers and lecturers are hosted in companies to be trained on the use of new or updated software or equipment. The relationships with partners are informal and it could be recommended to set up more formal and long-term partnerships.

**The number of academic staff, technical staff and administrative staff is high regarding the number of students.** The Department is clearly very well supported in terms of researchers and teachers and administrative support. The Programme has a standard classroom with up-to-date teaching facilities such as smart display unit for lectures and seminars or connected white board. There is a high-quality internet access available to students, providing access to various pedagogical online resources. Facilities are shared within the department (Library) or at the University level (central library or computer room). Common rooms are available for students allowing to work alone or in small groups. The laboratories are equipped with standard and appropriate devices which benefits to all Department's members and to companies willing to perform tests following the standards and recommendations.

**A mentoring policy exists both at the University and the Departmental levels for new staff members.** Newly recruited teachers are mentored to help them become familiar with the University's culture and their job description. During this period, they take benefits from informal mentoring from the Head of Department and senior colleagues. Then, they are assigned to senior colleagues to help orientate them to the Department and

its procedures, policies, and personnel and provide them guidance on career progression. A Prospectus of Postgraduate Studies and Regulations Governing Higher Degree Studies at Ahmadu Bello University is available, describing the rules and regulations guiding the conduct of the postgraduate programme.

**For academic staff members, teaching competence is assessed by performance reviews at the end of every academic session.** The performance reviews involve students' evaluation of teaching and the Head of Department's report which shall be based on the course report submitted by the lecturer. However, no information is provided regarding the methodology used for students' assessment. The programme is regularly evaluated by the National Universities Commission and the M.Sc. in Mechanical Engineering has been accredited nationally in 2022 for five years.

**The procedure of the student recruitment is clearly defined in the Admission Recruitment Section of the Postgraduate Handbook provided by the Department of Mechanical Engineering.** The required diploma and minimum honours as well as the evaluation procedures and graduation requirements are defined and transparent. The evaluation of knowledge follows accurate procedures that are common to all the M.Sc. programmes of the University, and are well described in the Quality Assurance policy. These procedures are clear for the students. An assessment survey is asked to the students for all courses. No information about the number of responses filled by the students is provided. The survey is analysed at the PG coordinator level. Students can also write directly to Head of Department. The programme has defined and implemented anti-plagiarism for the thesis report, and anti-fraud measures for examination. For instance, similarity index should not exceed 25% for the dissertation to be acceptable for external examination.

**In conclusion, the contributors to the programme have a very good level of expertise covering the full scope of the M.Sc. in Mechanical Engineering programme. The number of teaching staff, technical staff and administrative staff is adequate and satisfying. The programme organisation is clearly defined and efficient, and the pedagogical resources available at the department, the faculty or the university are of a high level.** It is important to indicate that a significant financial contribution would make it possible to renew certain equipment for the benefit of students, as well as providing access to costly simulation software licences. The different procedures for recruitment and examination are well detailed and explained in an extensive way in the PG Handbook. Continuous assessment of the courses is performed, this process is systematic, and the feedback is taken into account. However, no information is provided in terms of the number of responses received or the tool used to perform this assessment. The integration of newly recruited staff is efficient, and a mentoring strategy is organised.

## VI. CONCLUSION

The M.Sc. programme in Mechanical Engineering is in line with the University strategy as well as the socioeconomic needs. Indeed, this M.Sc. is perfectly integrated and complementary to other programmes of the Faculty of Engineering. The programme addresses the challenges associated with Production, Mechatronics, and Renewable Energy in a comprehensive and engaging manner. The programme organisation is clearly defined and efficient and the high-level pedagogical resources available in the Department, the Faculty or the University. The different procedures for recruitment and examination are well detailed and explained in an extensive way in the PG Handbook. The environment is favourable for students to develop their two-year research project. More national laboratories complement their research needs, as for material characterisation purpose for instance (Shell Office Lab. or Umaru Musa Yaradua University Central Lab). The programme involves 22 full-time academic members and some of them have very good track-record publications allowing relevant supervision of Master's students. The integration of newly recruited staff is efficient, and a mentoring strategy is organised. These students are able to pursue a Ph.D. within the same Department. It would be interesting to add core courses on ethics and research integrity.

It appears that the curriculum is consistent and set out in a comprehensive manner. For two years, students attend to core and electives courses required in Production, Mechatronics and Energy Studies, based on dedicated and well-defined courses. Interdisciplinarity and multidisciplinary are proposed through courses available in other Departments of the University. The expected knowledge and skills are well-defined and will help to address main challenges of the society. Even though partially addressed, additional skills relevant to their job-market integration might be more formally proposed to M.Sc. students. The job-market integration monitoring highlights a good integration of the graduates mainly in the economic sector or in Ph.D. programmes but the number of unemployed is high. Indeed, a one-month internship is mandatory for students belonging to the ACENPEE programme, which is not sufficient to gain skills even though they have already completed a six-month internship during the B.Eng. programme.

The programme offers longstanding partnerships with academic and socioeconomic actors at the local and national levels. The links are well-established through several effective partnerships with public institutions and private companies, which present a real added value to the programme. It would be interesting to further involve these partners in the curriculum definition and evolution and to propose more professional seminars and case studies. Partnerships with foreign universities have been signed and two students have benefited from an outgoing mobility. International opportunities are mainly available to students thanks to the alumni, even though a global approach is given by the Policy Assurance Committee at the University level. Despite the national situation, international mobility could be improved, especially regarding incoming foreign students.

The attractiveness of the programme is monitored. A survey as a tool for assessing the M.Sc. Programme exists at the Department level to comply with the Policy of the University and results should be sent to the Quality Assurance Committee which, in turn, gives back recommendations to the Head of Department. The teaching methods are diversified even though online courses are rare. It is important to indicate that a significant financial contribution would make it possible to renew certain equipment for the benefit of students, as well as providing access to costly simulation software licences.

### STRENGTHS

- The attractiveness of the programme, and the selection made to host the best students
- The very high level of expertise of the academic staff, and the adequate number of permanent staff
- The intense links with socio-economic partners, which are very helpful for the development of the programme
- The satisfactory number of available equipment and material resources provided for teaching and research activities
- The high number of students supported by grants

### WEAKNESSES

- The low success rate, which leads to have too many students in their second year at the same time
- The poor monitoring of job-market integration, and the limited preparation for job-market integration
- The not fully satisfactory actual state of equipment
- The low number of outgoing students, even though MoUs are signed
- External contributors and students are not involved in any bodies in the Department.

## RECOMMENDATIONS

- Monitor the success rate closely to understand better a high number of students are not graduating. Increased tutoring and the formation of levels groups can be beneficial for students. For students who currently lack financial support, providing grants or research grants would be highly valuable.
- Better prepare students for their job-market integration. In addition to informal current practices, dedicated course can be provided for a better skill language, writing CV and covering letter and preparing the interviews. An annual monitoring is a good way to check whether the actions taken are sufficient or not.
- Labs are well-equipped; however, there is a need to renew and complement them with up-to-date equipment that corresponds to the latest standards.
- The outgoing mobility can be very useful for second year students and new staff members. By increasing the numbers of international partnerships, it would be possible to increase the outgoing mobility. The possibility offered should be publicised.
- Involve external contributors currently who are working in partnership to participate in bodies within the Department. They can provide fair yet objective view on the actual Curriculum and propose complements to better match with the socio-economic needs. The same approach could also be beneficially extended to students.

## VII. COMMENTS OF THE INSTITUTION



### **AHMADU BELLO UNIVERSITY** **ZARIA, NIGERIA.** **OFFICE OF THE VICE-CHANCELLOR**

Vice - Chancellor: Professor Kabiru Bala, BSc.(Hons) Building, M.Sc. (Bldg.Serv.), MBA, PhD (Const. Mgt.) (ABU), FNIQB, MAPM, MCABE, C. Bldg E, MICIArb

VC/REL/43

16<sup>th</sup> May 2024

Mr. Stephane Le Boulter,  
Acting President,  
Higher Council for the Evaluation of Research and  
Higher Education (HCERES),  
2 rue Albert Einstein, 75013 Paris.  
France

Dear Sir,

#### **RESPONSE TO OBSERVATIONS FROM INTERNATIONAL GAP ASSESSMENT FOR M.Sc MECHANICAL ENGINEERING PROGRAMME**

I write to acknowledge the gap assessment report on M.Sc. Mechanical Engineering programme sponsored by Africa Centre of Excellence on New Pedagogies in Engineering Education (ACENPEE), Ahmadu Bello University, Zaria, Nigeria.

The recommendations are well noted and the University administration through the relevant academic organs will ensure that close monitoring of the students will be carried out to better understand the high number of students not graduating and hence reverse the trend.

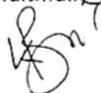
The curriculum of the program will be reviewed and upgraded with input from industrial partners, alumni, community to better meet the socioeconomic need. Furthermore, courses such as research Ethics, scientific integrity, emerging issues/new challenges and communication skills will also be incorporated to better prepare the students for job market integration, some of these courses will be handled by professionals from the industry.

A mandatory internship for all students with increased duration than the present one-month will be incorporated in the training program. Mobility programs for students and faculty will be encouraged to improve international partnership.

Financial support will be sought from relevant government funding agencies and private sector to provide scholarship and research grants to be able to attract more national and foreign students as well as maintain and purchase new equipment and software's, for training.

Finally, an annual monitoring evaluation will be carried out to check progress.  
Accept my highest regard.

Yours faithfully,



Prof. Kabiru Bala  
Vice Chancellor





2 rue Albert Einstein  
75013 Paris, France  
T. 33 (0)1 55 55 60 10

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## ACCREDITATION DECISION

### M.Sc. Mechanical Engineering

Africa Centre of Excellence in New Pedagogies  
on Engineering Education (ACENPEE)

Ahmadu Bello University

Zaria, Nigeria

**June 2024**

## SCOPE OF THE ACCREDITATION GRANTED BY HCÉRES

HCÉRES has based its evaluation process on a set of objectives that study programmes must pursue to ensure recognised quality within France and Europe. These objectives are divided up into four accreditation criteria.

The Accreditation Commission issues an opinion about the accreditation of the study programme after examining the file. The Hcéres President takes the decision based on the Commission's opinion and the final evaluation report of the programme. This accreditation decision, taken in plenary session, is the result of a collegial and reasoned process.

The decision issued by Hcéres regarding the accreditation of the study programme corresponds to the awarding of a label to the evaluated entity.

This decision is independent of the accreditations carried out by the French State and therefore does not entail recognition in France of the institution or the diplomas delivered by it.

**Decision No. EI-2024-32 on the accreditation of the M.Sc. Mechanical Engineering, delivered by Ahmadu Bello University, Zaria, Nigeria**

**The President of the High Council for the Evaluation of Research and Higher Education,**

Considering the Research Code, in particular Articles L. 114-3-1 to L. 114-3-6;

Considering the Board's deliberation of 29<sup>th</sup> September 2022 on the accreditation criteria for courses abroad (excluding doctoral/PhD programmes);

Considering the Decision No. 2023-9 of 16<sup>th</sup> March 2023 on the international accreditation procedure of the High Council for the Evaluation of Research and Higher Education;

Considering the agreement DEI\_2023\_CONV17 of 14<sup>th</sup> June 2023 for the evaluation/accreditation of fourteen training courses, delivered by six Centres of Excellence in Nigeria;

Considering the opinion issued by the Accreditation Commission on 18<sup>th</sup> June 2024;

**Decides:**

**Article 1**

Noting that the M.Sc. Mechanical Engineering delivered by Ahmadu Bello University in Nigeria meets the four accreditation criteria, voted by the Board of the High Council on 29<sup>th</sup> September 2022, as follows:

**ACCREDITATION CRITERION 1: TEACHING POLICY AND CHARACTERISATION**

The programme of M.Sc. in Mechanical Engineering is perfectly in line with the University strategy as well as the socioeconomic needs. Indeed, this M.Sc. is perfectly integrated and complementary to other programmes of the Faculty of Engineering of the University. The programme addresses the challenges associated with Production, Mechatronics, and Renewable Energy in a comprehensive and engaging manner.

The programme proposes longstanding partnerships with research and socioeconomic actors at both the local and the national levels. The required facilities (equipment, library, software) for research are available. The environment is favourable for the students to develop their one-year research project. More national laboratories complement their research needs, as for material characterisation purpose for instance (Shell Office Lab. or Umaru Musa Yaradua University Central Lab).

These students can pursue a Ph.D. within the same Department. It would be interesting to add core courses on ethics and research integrity. There are well-established links with the socio-economic partners through several effective partnerships with public institutions and private companies, which present a real added value to the programme. MoUs have been signed at the University level, allowing outgoing mobility with foreign universities. These international exchanges could be improved in particular regarding incoming foreign students.

**ACCREDITATION CRITERION 2: THE PEDAGOGICAL ORGANISATION OF THE STUDY PROGRAMME**

The curriculum of the M.Sc. programme is consistent and set out in a comprehensive manner. Students attend core and electives courses required in Production, Mechatronics and Energy Studies, based on dedicated and well-organised courses. Interdisciplinarity and multidisciplinary are proposed through courses available in other Departments of the University. The expected knowledge and skills are well-defined and help to address society's main challenges. The teaching methods are diversified even though online courses are rare.

A one-month internship is mandatory for ACENPEE students' programme, which is insufficient even though they have already completed a six-month internship during the B.Eng. programme. A research project running for two years mixing practical and theoretical works is proposed. Formal lectures supported by laboratory work, studio practices, seminars and case studies constitute the framework of teaching in the Department. Partnerships with foreign universities have been signed and have benefited to two students for an outgoing mobility but international opportunities are mainly available to students thanks

to Alumni through social networks, even though a global approach is given by the Policy Assurance Committee at the University level. Even if partially addressed, additional skills relevant to their job-market integration might be more formally proposed to the M.Sc. students. The acquisition of language skills required for a good job-market preparation and integration is implicit within the programme and not clearly proposed.

### ACCREDITATION CRITERION 3: ATTRACTIVENESS, PERFORMANCE AND RELEVANCE OF THE STUDY PROGRAMME

The attractiveness of the programme is monitored. The number of enrolled students is adequate compared to the hosting capabilities. The monitoring process is not detailed. However, the number of foreigners hosted in the programme is increasing. A survey as a tool for assessing the M.Sc. programme exists at the Department level to comply with the Policy of the University and results should be sent to the Quality Assurance Committee which in turn, gives recommendations to the Head of Department. The job-market integration monitoring highlights a good integration of the graduates mainly in the economic sector or in Ph.D. programmes, but the number of unemployed is high. Modern social media are also used by the programme to stay in contact with graduates.

### ACCREDITATION CRITERION 4: MANAGEMENT AND CONTINUOUS IMPROVEMENT OF THE ACADEMIC PROGRAMME

The contributors to the programme have a very good level of expertise covering the full scope of the M.Sc. in Mechanical Engineering programme. The number of teaching staff, technical staff and administrative staff is adequate and satisfying. The programme organisation is clearly defined and efficient, and the pedagogical resources available at the department, the faculty or the university are of a high level. It is important to indicate that a significant financial contribution would make it possible to renew certain equipment for the benefit of students, as well as providing access to costly simulation software licences.

The different procedures for recruitment and examination are well detailed and explained in an extensive way in the PG Handbook. Continuous assessment of the courses is performed, this process is systematic, and the feedback is taken into account. However, no information is provided in terms of the number of responses received or the tool used to perform this assessment. The integration of newly recruited staff is efficient, and a mentoring strategy is organised.

## Article 2

The M.Sc. Mechanical Engineering delivered by Ahmadu Bello University in Nigeria, is accredited for a period of five years from the date of this decision.

## Article 3

The decision is accompanied by the following recommendations and comments:

- Monitor the success rate closely to understand better a high number of students are not graduating. Increased tutoring and the formation of levels groups can be beneficial for students. For students who currently lack financial support, providing grants or research grants would be highly valuable.
- Better prepare students for their job-market integration. In addition to informal current practices, dedicated course can be provided for a better skill language, writing CV and covering letter and preparing the interviews. An annual monitoring is a good way to check whether the actions taken are sufficient or not.
- Labs are well-equipped; however, there is a need to renew and complement them with up-to-date equipment that corresponds to the latest standards.
- The outgoing mobility can be very useful for second year students and new staff members. By increasing the numbers of international partnerships, it would be possible to increase the outgoing mobility. The possibility offered should be publicised.
- Involve external contributors currently who are working in partnership to participate in bodies within the Department. They can provide fair yet objective view on the actual Curriculum and propose



complements to better match with the socio-economic needs. The same approach could also be beneficially extended to students.

**Article 4**

This decision will be published on the Hcéres website.

Paris, 27<sup>th</sup> June 2024.

The acting President

signed

Stéphane Le Bouler



2 rue Albert Einstein  
75013 Paris, France  
T. 33 (0)1 55 55 60 10

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