



## **Factors Influencing Students' Acceptability of Mechatronics Engineering Course: Evidence from Mbeya University of Science and Technology, Tanzania**

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**Abstract:** This study examined factors Influencing Students' acceptability of Mechatronics Engineering Course. The study utilized the descriptive survey research design and quantitative research approach to address the research problem. A random sample of 138 respondents was drawn from the population of 260 students taking mechatronic engineering at Mbeya University of Science and Technology. Data was collected through a structured questionnaire. The statistical treatment of data was done through descriptive statistics in terms of mean scores. The study established that acceptability is influenced by both learning factors and employability factors. Mechatronic engineering program promotes students learning motivation due to its collaborative and interactive nature. Students' learning motivation was highly influenced by the way the course focused on hand on skills, thus stimulating the learning environment. Based on the conclusions, it is recommended that to increase acceptability of the course among students, the program should be designed in such a way that it sharpens practical skills among students. This can be achieved by establishing mechatronic workshops which should be furnished with necessary equipment and facilities to allow students to acquire practical skills for self-employment. Finally, technical training colleges and higher learning institutions which offer mechatronic engineering programs should invest in supportive learning and teaching facilities. Availability of facilities is also necessary to cultivate learning motivation among students.

**Keywords:** Mechatronics Engineering; Students' acceptability; Mbeya University; Science and Technology.

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### **Introduction**

Mechatronics has been defined by Phan and Ngo (2020) as an interdisciplinary subsection of engineering whereby mechanical and electrical engineering overlap. According to Stankovski et al., (2019), mechatronics is one of the rapid growing disciplines supported by the continued implementation of the fourth industrial revolution. On the other hand, De Silva (2019) conceptualized mechatronics as an application of mechanics, electronics, computer engineering, and intelligent control systems in modeling, analyzing, designing, developing and implementing smart

electromechanical products. Mechatronics integrates information technology, internet, robotics, programming, data control systems and digital systems (Torres-Corrales & Montiel-Espinosa, 2019; Mynderse, Lotfi, Bajaj, Vikas and Gennert, 2020; Takács, Konkoly & Gulan, 2019).

Mechatronics is, however, more than just an overlapping technologies, rather, a unique way of looking upon things (Benítez, Castillo & Okuno, 2020). It rather includes the discovery of new technical functions, increasing the range of parameters used for various machine controls. It has to do with enhanced flexibility, size reduction, speed

of work, optimized productivity and minimization of cost as a result of physical integration (Laužikas, Miliūtė, Morozovaitė & Karpičius, 2021; Sima & Zapciu, 2020). In the context of this study, the way mechatronics integrates different technologies is an intrinsic feature for students' learning motivation.

The discipline is experiencing tremendous dynamic growth in the current years (Lyman, Sanford, Wilcox and Sorey, 2021). The growing importance of mechatronics engineering is due to the rapid change and advancement in technology (Marzano, Martinovs & Induce, 2019). Berry, Gennert and Reck (2020) pointed out that as digital technology continues to evolve, bringing significant changes, Technical Institutions also see the importance to integrate mechatronics in their training so as to meet the demands of its learners and the forth industrial revolution. Moreover, Wu and Liu (2022) have it that module curriculums should currently be designed in a way that mechatronics teaching methods in vocational and technical Colleges meet the requirements of enterprises.

According to Lotfi et al., (2020), mechatronics cannot be avoided in the 21<sup>st</sup> Century as it gives learners an opportunity to develop and exercise their critical thinking and creativity. Through the use of problem-solving skills in mechatronics, learners quickly gain their confidence as they prepare for the implementation of the new industrial world. Wang (2021) noted that mechatronics engineering is essential in the labor industry due to its evolving automation in manufacturing, thus making factories smarter and more efficient. This increases productivity and the overall equipment effectiveness.

In line with students' learning motivation as a result of introduction of the mechatronic courses, Ford, Ritz and Fisher (2020) and Makarova, et al., (2020) realized that students are motivated to learn the challenging technologies and experiences. This is due to the fact that when acquiring challenging skills, learners feel they are more advanced and can fit the industrial world. On the other hand, Lyman, Sanford, Wilcox and Sorey (2021) argued that mechatronics can facilitate effective learning where resources and facilities are available. Cementing on the same view, Murphy and Bruton (2020) exposed that learning mechatronics fosters students' thinking in new and interesting ways, thus fulfilling their expectations, those of the teachers, parents and of the community at large.

In countries like China and United States, mechatronics technologies have been taught in Technical Institutions for many years. For instance, Stankovski, et al., (2019) indicated that the Faculty of Technical Sciences, University of Novi Sad and College of Information and Electrical Engineering, China, Agricultural University has integrated mechatronics as it is one of the main features of the concept of the fourth industrial revolution. Wang and Wang (2019) align within the same idea by arguing that the course acceptability and students' learning motivation in mechatronics have been improved compared to the non-mechatronics engineering disciplines.

In the United States, mechatronics was originally viewed as a simple combination of mechanical and electrical systems. Due to technological advancement, the field of mechatronics has expanded to include other aspects such as mechanical engineering, electronics, computer engineering and controls engineering. This multidisciplinary nature of this discipline makes it one of the essential disciplines in Technical Institutions as it constructs new capabilities as pointed out by Rabb and Righter (2020).

A recent study in Nigeria by Oluwatimilehin, Chimezia and Danladi (2021) found that it is essential that mechatronics be integrated into technical college curriculum. The integration fosters students' learning motivation. It was also pointed out by Benítez, Castillo and Okuno (2020) that for mechatronics to be effectively implemented in technical colleges, partnership with automobile industries should be maintained. This gives an expression that mechatronics should become an essential part in curriculum within technical colleges in Africa.

Tanzania, like any other developing country is striving to ensure that the tremendous and rapid growth of technology is integrated into her education system (Kalolo, 2019). Introduction of mechatronics courses in different levels of technical education is one of key initiatives in place. To ensure that there is a preparation of effective mechatronics engineering curriculums, capacity building among developers and implementers have been given priority. Dante (2019) conducted a study on mechatronics capacity building in Tanzania and revealed that capacity building on mechatronics contributes positively to the understanding of

mechatronics technology and how it can be integrated into the curriculum.

On the same view, Braghin and Cinquemani (2017) argued that mechatronics curriculum implementers need to understand and deliver the content effectively in order to introduce students with topics that will be a challenge for the emerging industry of Tanzania. A survey by National Council for Technical Education (2020) on mapping skills gap and skills needs for technician graduates in the selected economic sectors for industrial growth in Tanzania indicated that;

*Skills gap has been established almost in every sector studied. The overall picture is consistent with the view that new technologies, especially the information technology is raising the skills level needed to thrive in the workplace. Technical institutions should develop relevant courses/programs that will address the missing skills identified in this survey (Pg.52).*

It is from this context that NACTE saw the rationale of incorporating mechatronics engineering courses in its registered Technical Colleges in the country. Currently few technical institutions in Tanzania offers certificate, Diploma and Bachelor Degree in mechatronics engineering. Among them are Mbeya University of Science and Technology, Dar es Salaam Marine Institute and Mary Immaculate Institute of Technology and Management. This study examined factors Influencing Students' acceptability of Mechatronics Engineering Course. The study was guided by two objectives. The first objective was to describe factors influencing students' acceptability of mechatronics engineering course. The second objective was to determine the influence of mechatronic engineering on learning motivation.

## **Review of Related Literature**

### **Theoretical Framework**

The study was guided by the intrinsic and extrinsic motivation theory. The theory indicates that human behavior is influenced by intrinsic and or extrinsic aspects of motivation as pointed out by Sansone and Tang (2021). The theory continues to be one of the most extensively referenced theoretical frameworks for students' learning motivation. This theory argues that learning can be motivated intrinsically, extrinsically or both. While Ryan and Deci (2020) argue that intrinsic motivation refers to the situation whereby an individual does something for the sake of personal satisfaction, Legault (2020)

indicated that extrinsic motivation means doing something for the expectation of getting external reward or pressure of something.

This theory is directly related to the topic under investigation since both intrinsic and extrinsic motivation may influence the students' learning motivation in mechatronics engineering. Intrinsic motivators include the interesting course contents, course value and acquisition of new technology and meeting their learning goals. On the other hand, extrinsic motivators include highly demanded course in the labor market, competition in employment opportunities and pressure to get the mechatronics engineering certificate. On the same vein, Lyman, Sanford, Wilcox and Sorey (2021) and Tokan and Imakulata (2019) agreed that both internal and external rewards may influence the learning motivation. This theory therefore helped the researcher in understanding the mechatronics engineering course in the eyes of technical colleges' students.

### **Empirical Literature Review**

The evolution of mechatronics has led to numerous technological advancements since the early 20th century (Luque-Vega et al., 2019). Takács, Konkoly and Gulán (2019), on the other hand, added that through mechatronics, the world has been reshaped smarter for the aim of improving the human well-being. Haughery, Raman, Olson and Freeman (2019) in their work on robots, motivation and academic success pointed out that the introduction of mechatronics in education has influenced students' learning motivation and students' engagement in general. For instance, the use of robots in leaning motivates students as it gives learners the ability to learn on the current industry applicable equipment.

A study by Oluwatimilehin, Chimezia and Danladi (2021) on integration of automobile mechatronics technology into the curriculum of automobile trades programs at the technical colleges in Nigeria revealed that the introduction of mechatronics in technical colleges is inevitable in the 21<sup>st</sup> century due to its high demand in the implementation of industry 4.0. This shows the necessity of the sophisticated skills as they may increase chances of being employed among mechatronics engineering graduates.

Li (2021) conducted a study on teaching mechatronics to non-traditional mechanical engineering students, an adaptive approach in Shanghai. The study observed that switching from

traditional mechanical engineering to mechatronics among students was easy compared to the non-traditional mechanical engineering. This implies that students were motivated to learn mechatronics engineering courses.

Moreover, Habib, Nagata and Watanabe, (2021) conducted a study on mechatronics: experiential learning and the stimulation of thinking skills in Cairo and found that mechatronics as discipline in technical institutions promotes a comprehensible collaborative synchronized design process that enhances innovation among students and develops the anticipated skills. Lara-Prieto, et al, (2019) also commented that to promote students' engagement, rigor and motivation, teaching and learning for mechatronics should be designed in a way that it is more experimental. In this case, there should be well designed lecture rooms and workshops for experiments integrated with course projects.

In contrary, Patange, et al. (2019) in their study on improving program outcome attainments using the project based learning approach for mechatronics in India revealed that some students are not motivated in learning mechatronics because of poor ICT backgrounds which is an important aspect in mechatronics learning. Phan and Ngo (2020) supported the idea of Patange, et, al, (2019) that quality learning of mechatronics is associated with the application of ICT. Therefore, in the context of Tanzania, the teaching of ICT should be strengthened from primary to secondary level if mechatronics learning motivation has to be effectively realized.

In their work, Habib, Nagata and Watanabe, (2021) has it that "as an interdisciplinary field, mechatronics is evolved into a philosophy supporting new ways of thinking, interdisciplinary knowledge synergy, work and practices, skills, as well as innovations" (Pg.14). This implies that mechatronics engineering course has been designed in a way that it is hands-on-skills oriented, involves industrial practical training and is based on problem solving skills as concurred by Oluwatimilehin, Chimezia and Danladi (2021).) in their study on developing competencies in a mechanism course using a project-based learning methodology in a multidisciplinary environment. It was revealed that project based learning not only fostered mechatronics' student's competence but also increased their motivation and appreciation to the course.

A systematic review by Haughey and Raman (2016) provided evidence that mechatronics experiences can increase the students' learning motivation. The study further revealed that students' learning motivation is one of the vital keys in academic achievement. Similarly, Garcia, Guzmán Ramírez, Arias-Montiel & Lugo González (2020) realized that the higher students learning motivation in young mechatronics engineers is because of the use of a robotic hand to facilitate and accelerate the teaching/learning process. This makes the learning process easy and interesting.

Furthermore, Arrambide-Leal, Lara-Prieto, García-García & Membrillo-Hernández (2019) found that mechatronics engineering has been a course of choice of many students because of its soft skills such as critical thinking and problem solving. It was further found that mechatronics engineering has attracted the attention of students simply because its mode of learning has smashed away the traditional way of learning into hands on experience. Cementing on the same idea, Ford, Ritz and Fisher (2020) agreed that the hands-on experience acquired from learning mechatronics promotes the acquisition of skills and competencies among graduates.

Arrambide-Leal, Lara-Prieto, García-García & Membrillo-Hernández (2019, p. 1859) in their study on robots, motivation and academic success in Mexico, revealed that "students in the mechatronic experience, while earning significantly higher grades, did not exhibit different levels of motivation, leading to no association between student motivation and course choice as well as academic success."

This gives an expression that despite the fact that mechatronics course employs interesting technologies, the mode of its delivery may not influence the learning motivation to the expected extent if not well planned. This has been proven by a recent study by Prasad, Rao, Rao, Kollem and Malathy (2022) who examined the design and implementation of problem-based learning and active learning in mechatronics course and found that there are teaching methods that are not satisfactory for 21<sup>st</sup> Century. The methods include non-interactive and non-problem solving approaches. This implies that for mechatronics engineering course to be effectively taught there should be active, interactive, collaborative and problem-based learning.

Al-Ratrout (2019) found that course acceptability and students learning motivation depend solely on the teaching methods applied. Furthermore, the study found that teaching practical agile methods in web engineering course influenced learning motivation for software engineering students. On the same note, Salza, Musmarra and Ferrucci (2019) agreed that among factors that motivate students' learning in mechatronics is the new approach of teaching that does not use paper examinations but rather hands-on activities and projects. This is to say, when the teaching methods is still traditional, students' learning motivation becomes minimal.

A study conducted in Mexico on challenge-based learning for experiential learning in mechatronics engineering by Félix-Herrán, Rendon-Nava and Jalil (2019) pointed out that for students' learning motivation to occur, interactive and experiential learning should be applied. Brown and Rayner, (2020) further added on the same idea that the first year engineering students are highly motivated with the ways courses are delivered in a collaborative manner. From this evidence, Oluwatimilehin, Chimezia and Danladi (2021) saw that interactive and experiential learning boot critical thinking and creativity so as to tackle the real world challenges. Spoettl and Tütlys (2020) in their study on education and training for the fourth industrial revolution found that vocational systems have to respond to the needs and expectations of the new technological challenges. Thus, the focus should be on curriculum development, teacher training and training of highly skilled workers in technological related fields including mechatronics engineering.

Literature from the global context reveals the necessity of mechatronics engineering courses in addressing the fourth industrial revolution challenges. Similarly, literature has indicated that students' learning motivation is influenced by both intrinsic and extrinsic motivators. Moreover, it has been proved by previous studies that mechatronics engineering course content, value and delivery methods influence course acceptability and learning motivation.

In Tanzania, studies about factors influencing students' acceptability of mechatronics engineering course Specifically in Technical Colleges, are lacking. This created a knowledge gap that was filled in this study. Therefore, this study examined factors Influencing Students' acceptability of Mechatronics

Engineering Course. Findings from this study are expected to improve course acceptability and learning motivation for technical institutions offering mechatronics engineering courses and to inform the National Council for Technical and Vocational Education and Training (NACTVET) to see the significance of mechatronic engineering course in its Technical Colleges as a means to fill the skill gap needed by technician graduates for industrial growth in Tanzania.

## **Methodology**

### **Research Design**

The study used the descriptive survey research design. According to Sharma (2017), the design is useful as it can answer what, where, when and how questions.

### **Population and Sampling**

Diploma students in Mechatronics Engineering course from Mbeya University of Science and Technology were of the particular interest to the investigation. The total number of students from which the sample was drawn was 260 from year I, II and III in the course. The systematic sampling was used to select 155 students. However, only 138 (89%) respondents filled and returned questionnaires.

### **Instruments**

Data was collected using a structured questionnaire which was prepared in English language as respondents were able to understand well the language. Taherdoost (2017) argues that the instrument is suitable as it covers many respondents in a short period of time and reduces biases from the collected information. The questionnaire had five options for respondents to indicate their level of agreement or disagreement as follows: SA= Strongly Agree A= Agree U- Undecided D=Disagree SD- Strongly Disagree.

### **Validity and Reliability**

To ensure validity, experts in research reviewed the data collection tools. All the suggested corrections were amended accordingly. This helped the researcher to be sure that the data was designed in such a way that it measured what was intended. In terms reliability of data collections tools, a pilot study was done to measure the internal consistency. Data from the pilot study were tested through SPSS. The test yielded the Cronbach's Alpha of above 0.8, thus the instrument was considered reliable.

## Statistical Treatment of Data

Data was resorted, coded, classified and tabulated. Descriptive statistics such as mean and standard deviation were used to analyze data with the aid of the Statistical Package for Social Science (SPSS Version 22). Descriptive statistics was suitable since it allowed a researcher to quantify and describe basic characteristics of data sets.

## Ethical Considerations

The researcher ensured that permits for data collection were obtained from respective authorities. Moreover, the researcher ensured that all respondents voluntarily participated in the study and the information collected was kept confidentially and was used for the purpose of the study only. Furthermore, the informed consent was highly adhered. Finally, the researcher ensured anonymity of respondents so as to safeguard their

identity by not writing their names or their registration numbers.

## Results and Discussion

This part presents findings and discussions. The part has been devised into two sections; the first section presents findings about characteristics of respondents and the second section presents findings for the study objectives that guided the study.

### Characteristics of Respondents

The study presents characteristics of respondents. Respondents were assessed in terms of gender, age and year of study. The results are presented in Table 1. Findings show that respondents were characterized by diverse gender, age groups and years of study. With regards to gender, findings show that 25.4% were females while 74.6% were males.

**Table 1: Characteristics of Respondents**

Variable	Categories	Frequency	Percent (%)
Gender	Females	35	25.4
	Males	103	74.6
Age	18-35 Years	134	97.1
	Above 35 Years	4	2.9
Year of Study	Year I	30	21.7
	Year II	48	34.8
	Year III	60	43.5

**Table 2: Learning Factors Influencing Students' Acceptability of Mechatronics Engineering Course**

SN	Learning Factors	N	Mean	Interpretation
1	The course offers me problem solving skills in the 21 <sup>st</sup> Century	138	4.1232	Agree
2	The course objectives are unique and interesting	138	4.2391	Strongly Agree
3	The course is a new discipline in Tanzania	138	4.3406	Strongly Agree
4	The course promotes critical thinking	138	4.3986	Strongly Agree
5	The course fosters creativity and innovation	138	4.4130	Strongly Agree
<b>Overall Computed Mean</b>		<b>138</b>	<b>4.3029</b>	<b>Strongly Agree</b>

These findings indicate that majority of respondents were males. With regards to age, findings show that 97.1% were aged between 18 and 35 years while 2.9% were aged above 35 years. These findings suggest that majority of respondents were youths. This is because the youth group is likely to be in college compared to the middle age and old age group. With regards to year of study, findings show that 21.7% of the respondents were in the First Year of Study, 34.8% were in the Second Year of Study, and 43.5% were in the Third Year of Study. Majority of respondents were males. These findings are similar to previous studies by Gross (2018) and Lubaale (2021) who indicated that women are underrepresented in science programmes such as

mechatronics. Gross (2018) found that women represented only 10% of students enrolled in Mechatronics programmes a private university in Ecuador.

**Objective 1:** To determine factors influencing students' acceptability of Mechatronics Engineering Course.

The first objective was to determine factors influencing students' acceptability of the Mechatronics Engineering Course. Two types of factors were tested. Learning factors as reflected in table 2 and employability factors as reflected in table 3. The mean score interpretation scale was as follows: 1.00-1.80=Strongly Disagree, 1.81-2.60=

Disagree, 2.61-3.40=Neutral, 3.41-4.20=Agree, 4.21-5.00=Strongly Agree.

Table 2 show that the overall computed mean for learning factors is 4.3029. This finding denotes that generally respondents strongly agreed that learning factors influence students' acceptability of the mechatronics engineering course. The most cited learning factor was creativity and innovation

(Mean= 4.4130). This was followed by critical thinking (Mean= 4.3986), the course being new (Mean= 4.3406), uniqueness of the course (Mean=4.2391) and problem solving skills (Mean=4.1232). These findings suggest that learning factors including creativity and innovation, critical thinking, problem solving, course uniqueness and course being new have influence on students' acceptability of mechatronics engineering course.

**Table 3: Employability Factors Influencing Students' Acceptability of the Mechatronics Engineering Course**

SN	Employability Factors	N	Mean	Interpretation
1	The course provides an opportunity for mechatronics engineering career development	138	4.0145	Agree
2	The course provides basic skills necessary for establishing small engineering related businesses	138	4.0797	Agree
3	The course satisfies the needs of the industry	138	4.1014	Agree
4	The course offers me opportunities to work with new technologies	138	4.1667	Agree
5	The course gives access to a wide variety of technologies	138	4.2029	Strongly Agree
6	The course offers me opportunities to fit in the current industrial field	137	4.2044	Strongly Agree
7	The course equips me with useful skills for employment	138	4.2174	Strongly Agree
8	The course provides understanding of current industry applicable equipment	138	4.2391	Strongly Agree
Overall Computed Mean			4.1532	Agree

With reference to Table 3, the overall mean for employability factors is 4.1532. This finding indicates that generally respondents agreed that eight employability factors influence students' acceptability of mechatronics engineering course. The employability factors include understanding of industrial applicable equipment (Mean= 4.2391), employment skills (Mean=4.2174); opportunities to fit in the industry (Mean=4.2044); access to technologies (Mean=4.2029); opportunities to work with new technologies (Mean=4.1667); satisfying needs of the industry (Mean= 4.1014); establishing small businesses (Mean=4.0797); and career development (Mean= 4.0145).

Based on these findings, it is observed that both learning factors and employability factors are influential in students' acceptability of mechatronics engineering course. This finding denotes that generally respondents strongly agreed that learning factors and employability factors influence students' acceptability of the mechatronics engineering course. These findings are similar to previous findings by Oluwatimilehin, Chimezia and Danladi (2021) and Gille, Moulignier and Kovesi (2021) who consistently showed that students take engineering courses for economic reasons such as employment opportunities. Moreover, Habib, Nagata and

Watanabe, (2021) supports these findings by showing that as an interdisciplinary field, mechatronics is evolved into a philosophy supporting new ways of thinking, interdisciplinary knowledge synergy, work and practices, skills as well as innovations which makes students accept and enjoy the course.

**Research Objective 2:** To establish the influence of mechatronics engineering course on students' learning motivation.

The second objective was to establish the influence of mechatronics engineering course on students' learning motivation. The findings are presented in Table 4. The mean score interpretation scale was as follows: 1.00-1.80=Strongly Disagree, 1.81-2.60=Disagree, 2.61-3.40=Neutral, 3.41-4.20=Agree, 4.21-5.00=Strongly Agree.

The overall mean score (Mean=3.7711) shows that respondents generally agreed that mechatronic engineering motivates students learning. This is through *positive learning attitude* (Mean=4.2609); *stimulating learning environment* (Mean= 4.1884), *promoting problem solving* (Mean= 3.8768), *promoting learning value* (Mean= 3.8784), *practical training* (Mean= 3.8478).

Furthermore, findings show that mechatronic engineering motivates students learning strategies (Mean= 3.8175); *motivating hands-on-skills* (Mean= 3.6957), *good evaluation methods* (3.6884), *use of technology in learning* (Mean= 3.6594), *students' engaging in learning* (Mean= 3.6377), *enhancement of mastery of skills* (Mean= 3.5870), *well equipped*

*labs* (Mean= 3.5797) and *collaborative learning* (Mean= 3.5652). These findings suggest that mechatronic engineering can influence students' learning motivation when are learning facilities such as laborites; clear delivery and evaluation methods, and practical learning environments.

**Table 4: Influence Mechatronics Engineering Course on Students' Learning Motivation**

SN	Influence Mechatronics Engineering	N	Mean	Interpretation
1	The course is taught in a way that is understood	138	3.5435	Agree
2	The course employs collaborative learning	138	3.5652	Agree
3	The course has well equipped mechatronics labs	138	3.5797	Agree
4	The course is well broken to enhance mastery of skills	138	3.5870	Agree
5	The course instructors engage students to meet their learning needs	138	3.6377	Agree
6	The course uses technology in its delivery	138	3.6594	Agree
7	The course has good evaluation methods	138	3.6884	Agree
8	The course is hands-on-skills oriented	138	3.6957	Agree
9	The course instructors use active learning strategies	137	3.8175	Agree
10	The course involves industrial practical training	138	3.8478	Agree
11	The course learning value is always emphasized	138	3.8478	Agree
12	The course promotes problem solving skills	138	3.8768	Agree
13	The course stimulates learning environment	138	4.1884	Agree
14	The course promotes positive learning attitude	138	4.2609	Strongly Agree
<b>Overall Mean</b>			<b>3.7711</b>	<b>Agree</b>

Findings have also shown that mechatronic engineering influences students' learning motivation when learning facilities such as laborites, clear delivery and evaluation methods and practical learning environments are available. These findings are in agreement with findings of Braghin and Cinquemani (2017) who revealed that effective teaching of mechatronic engineering in Tanzania requires availability of laboratories. Wang and Wang (2019) further noted that laboratories are necessary to allow students to link between theory and practice. Moreover, a study conducted in Mexico on challenge-based learning for experiential learning in mechatronics engineering by Félix-Herrán, Rendon-Nava and Jalil (2019) pointed out that students were motivated to learn the mechatronic engineering course because of its interactive and the experiential learning nature. The same was further supported by Brown and Rayner (2020) who established that the first year engineering students were highly motivated with the way courses are delivered in a collaborative manner.

## Conclusions and Recommendations

### Conclusions

The study concludes that acceptability is influenced by both learning factors and employability factors.

Students accepted to uptake mechatronic engineering because of the desire to learn and acquire new knowledge. More importantly, students desired to uptake the course because of employability and career factors such as employment opportunities and opportunities to establish small businesses in engineering. Hence, mechatronic engineering has potential in the labor market. The study further concludes that mechatronic engineering program promotes students learning motivation due to its collaborative and interactive nature. Students' learning motivation was highly influenced by the way the course focused on hand on skills, thus stimulating the learning environment.

### Recommendations

Based on the conclusions, it is recommended that to increase acceptability of the course among students, the program should be designed in such a way that it sharpens practical skills among students. This is because Mechatronics is a competence based program, requiring hands-on technical education. This can be achieved by establishing mechatronic workshops which should be furnished with necessary equipment and facilities to allow students to acquire practical skills for self-employment. In order to promote students' learning motivation,



technical training colleges and higher learning institutions which offer mechatronic engineering programs should invest in supportive learning and teaching facilities. Availability of facilities is also necessary to cultivate learning motivation among students.

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