



**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

**MAIN CAMPUS**

**UNIVERSITY EXAMINATIONS  
2020/2021 ACADEMIC YEAR**

**FIRST YEAR SEMESTER ONE EXAMINATIONS**

**FOR THE DEGREE  
OF  
BACHELOR OF SCIENCE IN CIVIL AND STRUCTURAL  
ENGINEERING/BACHELOR OF SCIENCE IN MECHANICAL  
AND INDUSTRIAL ENGINEERING/BACHELOR OF SCIENCE  
IN ELECTRICAL AND COMMUNICATION ENGINEERING**

**COURSE CODE: ECC 103**

**COURSE TITLE: INTRODUCTION TO ENGINEERING**

**DATE: FRIDAY 29TH JANUARY 2021 TIME: 12 – 2.00 PM**

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**INSTRUCTIONS:**

1. This question paper contains FOUR questions.
2. Attempt a total of THREE questions only.
3. QUESTION ONE IS COMPULSORY.
4. Marks for each question are indicated in the parenthesis.
5. Examination duration is 2 Hours.
6. Start each answer for new question on a fresh page.
7. Do not write or scribble any mark on the question paper.

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.

**Question ONE (40 marks)**

Figure Q1 shows some of the teaching approaches which have been adopted in various universities world-wide to teach STEM courses (Science, Technology, Engineering and Mathematics) during the COVID-19 pandemic.

- (a) Use the traditional face-to-face approach as the basis in T-Chart (Pugh's method) to select the most appropriate approach in the teaching of core engineering courses. (15 marks)
- (b) Use the weighted decision matrix to select the most appropriate mode of teaching an engineering programme from amongst the five approaches listed in Figure Q1 as applicable to MMUST engineering programmes. Base the decision on the twelve (12) - point criteria listed below. Use weighting on a scale of 1-5 and scores for the selected approach based on a range of 1 – 10 (where 1 is minimum score and 10 is maximum score). (25 marks)

**12-point Criteria:**

- Cost of the teaching approach
- Laboratory experiments
- Workshop practice
- Class lectures
- Tutorials
- CATs
- Carry away Assignments
- Written examinations
- Attachment
- COVID-19 health protocols
- Quality assurance
- Time to cover course content

**Question TWO (15 marks)**






- (a) Explain the meaning of creative and critical thinking in engineering discourse. Give suitable examples to illustrate your answer. (5 marks)
- (b) List any three notable achievements in engineering during the ancient time and three marvels in engineering in modern time (5 marks)
- (c) Discuss one major engineering failure in the world, in Africa and in Kenya. (5 marks)

**Question THREE (15 marks)**

- (a) Define the following terminologies and give three example to illustrate each answer.
- (i) Field of engineering
  - (ii) Engineering discipline
  - (iii) Programme of engineering
  - (iv) Engineering course
  - (v) Course unit. (5 marks)
- (b) Distinguish between:
- (i) The role of IEK and EBK in the practice of engineering profession in Kenya
  - (ii) Mass and weight, and hence determine the mass and weight of 20 litres of water on planet earth and on planet Jupiter with a surface gravitational acceleration of  $24.79 \text{ ms}^{-2}$ . (5 marks)
  - (iii) SpaceX Crew Dragon was launched from the Kennedy Space Center in Florida, USA to the International Space Station (ISS) at 0027 GMT on Monday 16<sup>th</sup> November 2020 at a speed of 27,000 km/hr. State the speed of the SpaceX Crew Dragon in, m/s, in knots and in ft/s. (5 marks)

**Question FOUR (15 marks)**

Explain briefly the dilemma faced by engineers in meeting societal expectations while using the resources in the four spheres of the planet earth in a sustainable way. Use suitable examples to illustrate your answer. (15 marks)

| <b>FIGURE Q1: LEARNING APPROACHES IN TEACHING OF STEM COURSES DURING COVID-19 PANDEMIC</b>  |   |
|---|---|
| <b>Learning Approach</b>  | <b>Graphics</b>   |
| <p><b>1. Traditional Face-to-Face Learning (TF-FL)</b><br/>In this approach use is made of chalk-board, white board, group or entire class discussions in lecture theatres and class rooms. Challenges of social distancing and use of protective equipment pose challenges.</p>  |     |
| <p><b>2. Traditional Distance Learning Strategy (TDLS)</b><br/>Learning materials are supplied and received from students by use of postal, curie and physical delivery services without use of digital technology.</p>   |    |
| <p><b>3. Virtual Labs, Meetings and Simulations (VLMS)</b><br/>Virtual labs, remote control labs or video-based labs which use simulation tools and virtual reality allow the undertaking of experiments through the internet, whereas video-based platforms such as YouTube provide a step-by-step overview of a real lab so that students can visualize the whole experimental process and its environment through a video.</p> |    |
| <p><b>4. Blended Online Teaching and Laboratory Experiments (BOTLE)</b><br/>Blended approaches using web-based activities and physical interactions in the labs support teaching and learning activities in campus-based courses using manuals for instructor and students as in the case of traditional face-to-face approach used in laboratory experiments, and web-based support centered on online platforms.</p>            |   |
| <p><b>5. E-learning under distance education mode (ELDE)</b><br/>Based on internet platform, ELDE works well for knowledge building through delivering content and oversight of some processes irrespective of student location. But one misses on physical interactions where encounter with professors and equipment, tools and machines is enriching experience.</p>   |  |