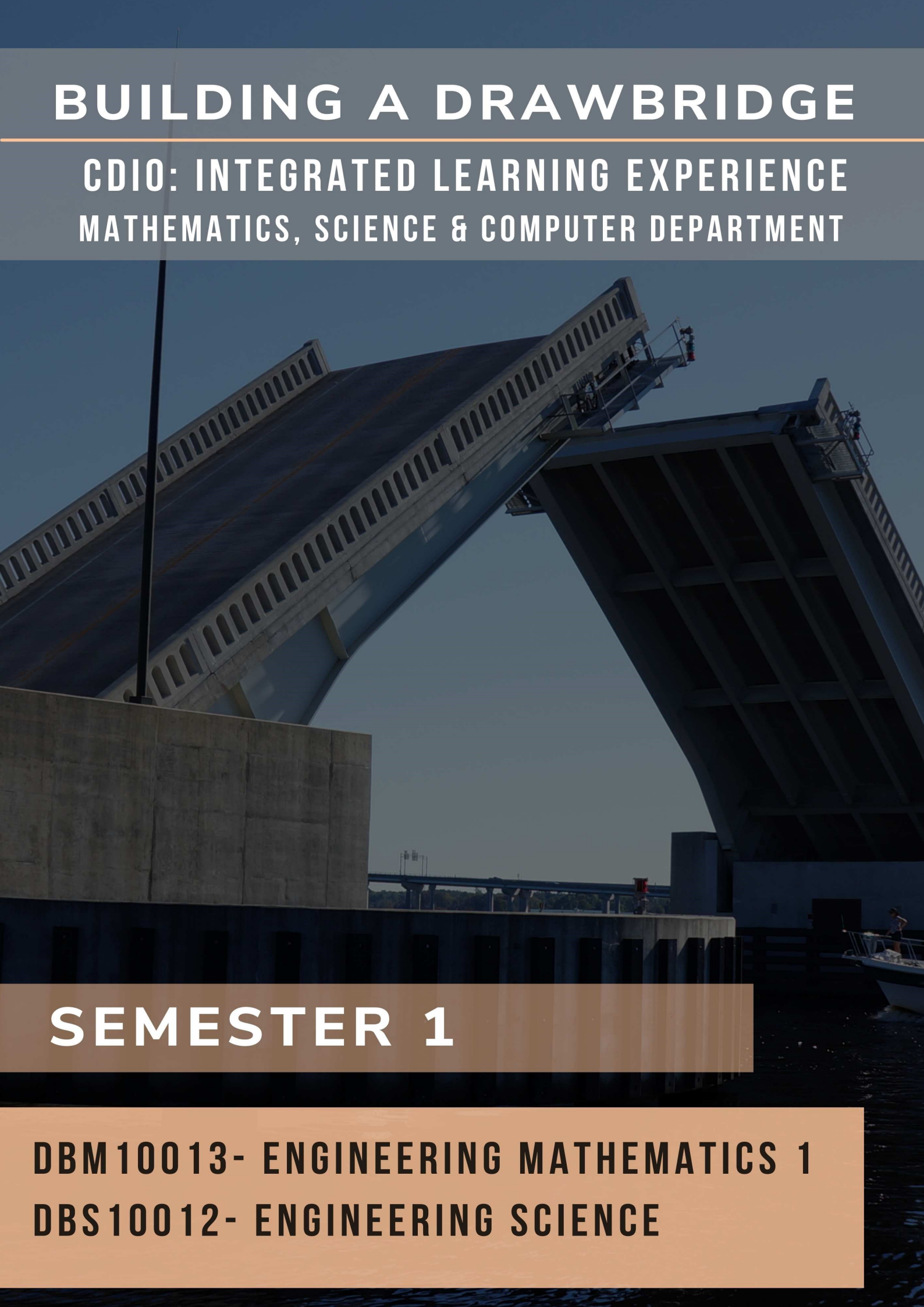
BUILDING A DRAWBRIDGE

CDIO: INTEGRATED LEARNING EXPERIENCE

MATHEMATICS, SCIENCE & COMPUTER DEPARTMENT



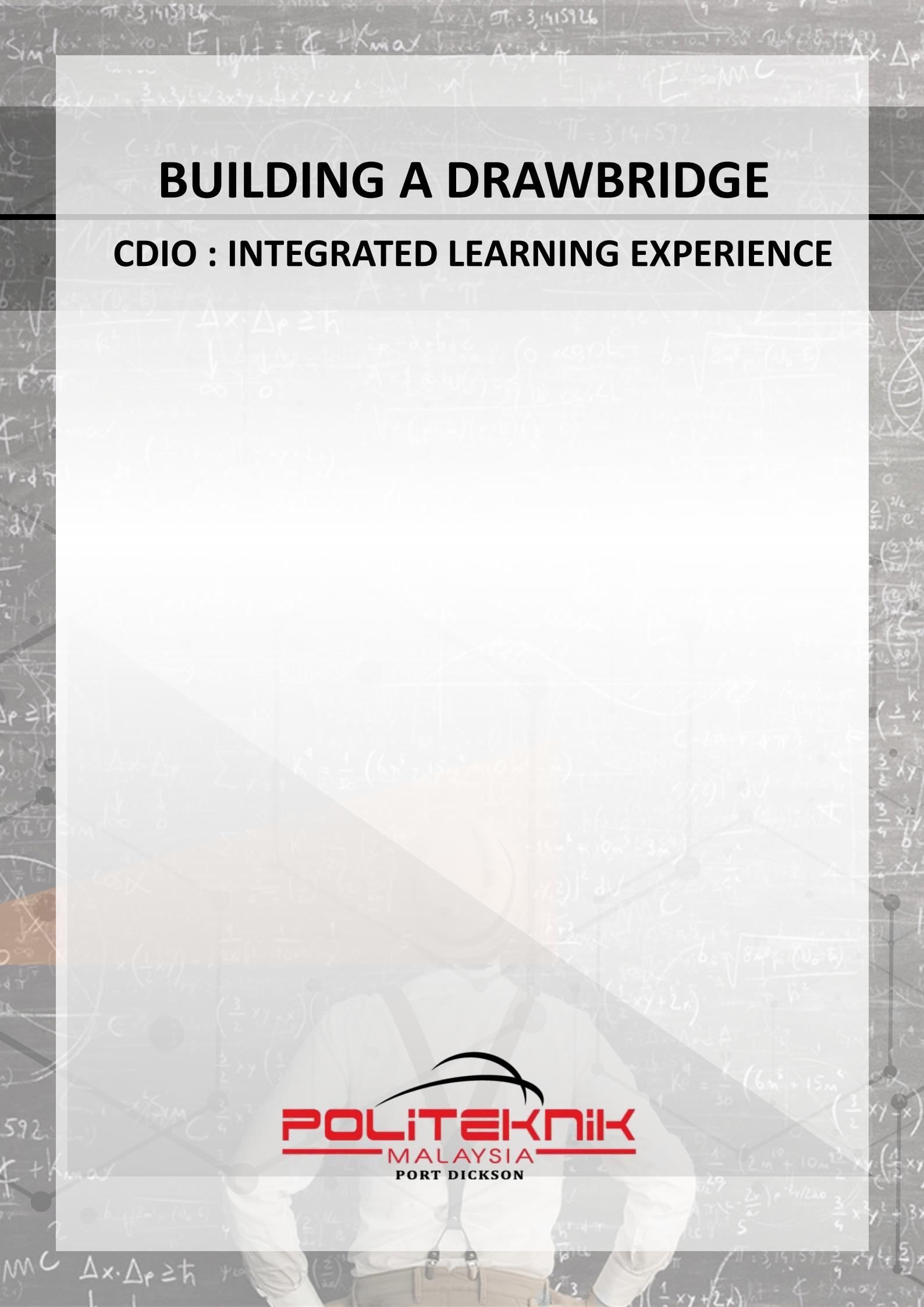
SEMESTER 1

DBM10013- ENGINEERING MATHEMATICS 1

DBS10012- ENGINEERING SCIENCE

BUILDING A DRAWBRIDGE

CDIO : INTEGRATED LEARNING EXPERIENCE



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MALAYSIA
PORT DICKSON

ACKNOWLEDGEMENT

EN. MOHAMAD ISA BIN AZHARI
Director, Polytechnic Port Dickson

DR. NOR HANIZA BINTI MOHAMAD
Deputy Director (Academic), Polytechnic Port Dickson

SALMIAH BINTI HUSAIN
Head of Mathematics, Science And Computers Department,
Polytechnic Port Dickson

FADHLIANA BINTI MOHAMOD
Head of Mathematics Unit, Polytechnic Port Dickson

NOORAIN BINTI ITHNIN
Head of Science Unit, Polytechnic Port Dickson

EDITOR
NOORAIN BINTI ITHNIN

WRITERS
DBM10013—ENGINEERING MATHEMATICS 1
FADHLIANA BINTI MOHAMOD
NORHALIDAH BINTI YUNUS

DBS10012—ENGINEERING SCIENCE
NOORAIN BINTI ITHNIN
SYAFARIZAN BINTI NASRODIN
MOHD SAIFUL BIN PAHRUDIN

GRAPHIC DESIGNER
MUHAMMAD LUTFI BIN OTHMAN

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Port Dickson, Negeri Sembilan.

August 2020

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FOREWORD

First of all, we would like to express our gratitude to Allah the almighty for granting us knowledge, strength and time to continue our good deeds to complete this book. We also want to express our thanks to all who involve directly or indirectly in making this project success.

Alhamdulillah, the book of Building a **Drawbridge CDIO : INTEGRATED LEARNING EXPERIENCE** finally published. This book is developed as a manual and guideline for both lecturers and students who involved in teaching and learning for integrated courses of **DBM10013: ENGINEERING MATHEMATICS 1** and **DBS10012: ENGINEERING SCIENCE** in Mathematics, Science and Computer Department of polytechnics.

This book contains guidelines that would help lecturers and students to understand upon conducting the **Science Mini Project** and **Engineering Mathematics 1 Presentation** for the whole semester in a structured way. It is also providing the notes of guidance, integrated course mapping, project briefing and design needs in producing a creative and better product. The rubric that been included in this book can also be used as a marking scheme that should be given during the assessment process and develop better understanding upon the syllabus requirements.

As additional information, this drawbridge project is our first integrated learning project. So, there are some shortcomings from our efforts. Yet we will not give up and will continue to improve it in the future. May our efforts bring benefits to polytechnic students and lecturers and also be a continuous process towards achieving our vision to become an excellent academy centre.

INTEGRATED LEARNING EXPERIENCE

SEMESTER 1

MATHEMATICS, SCIENCE & COMPUTER DEPARTMENT

Project Description

In Integrated Learning Experience, we integrate **2 courses in semester 1 (DBM10013-Engineering Mathematics 1 & DBS10012-Engineering Science)** of the Engineering Students. The project has integrated learning outcomes which infuses the CDIO skill sets of the 21st century skills.

1. Skills Development

- **design** a drawbridge by **integrated** Trigonometry and Pascal's Principle knowledge. (Calculation Skill)
- **apply** knowledge of Pascal's Principle to build a drawbridge model. *(Design Skill)*
- **deliver** an effective verbal, graphic (poster & slides) and video presentation *(Communication Skill)*

2. Project

- grouping task

3. Assessment methodology

- rubrics

COURSES	TOPICS	ASSESSMENTS
DBM10013 Engineering Mathematics 1	**Topic 2** Trigonometry	**Presentation 1** 7.5 %
DBS10012 Engineering Science	**Topic 5** Solid & Fluid	**Mini Project** 25 %

INTEGRATED LEARNING EXPERIENCE

Design of Integrated Learning Experience – Project

Project CLOs	Courses	Related CLOs	Assessment	Implementation Week
At the end of the project, students will be able to: 1. Solve trigonometry equations and identities 2. Apply the concept of Pascal's Principle	**DBM10013:** Engineering Mathematics 1	**CLO3:** Use mathematical expression in describing real engineering problems precisely, concisely and logically	**Presentation 1** 7.5 %	Week 3-6
	DBS10012: Engineering Science	**CLO 2:** Apply knowledge of fundamental physics in activities to mastery physics concept	**Mini Project** 25 %	Week 6-12

COURSE MAPPING

<table>
<tr><th>COURSE/ WEEK</th><th>DBM10013</th><th>DBS10012</th></tr>
<tr><td>W1</td><td colspan="2">Intro & Briefing the integrated learning process to the lecturer</td></tr>
<tr><td>W2</td><td colspan="2">Briefing to the students how the project will be run</td></tr>
<tr><td>W3</td><td>• Group division (3-4 students in each group)
• Students finding information of drawbridge</td><td>Lecturer list up the basic materials use for drawbridge
• Syringe
• Plastic tube
• Recycle items

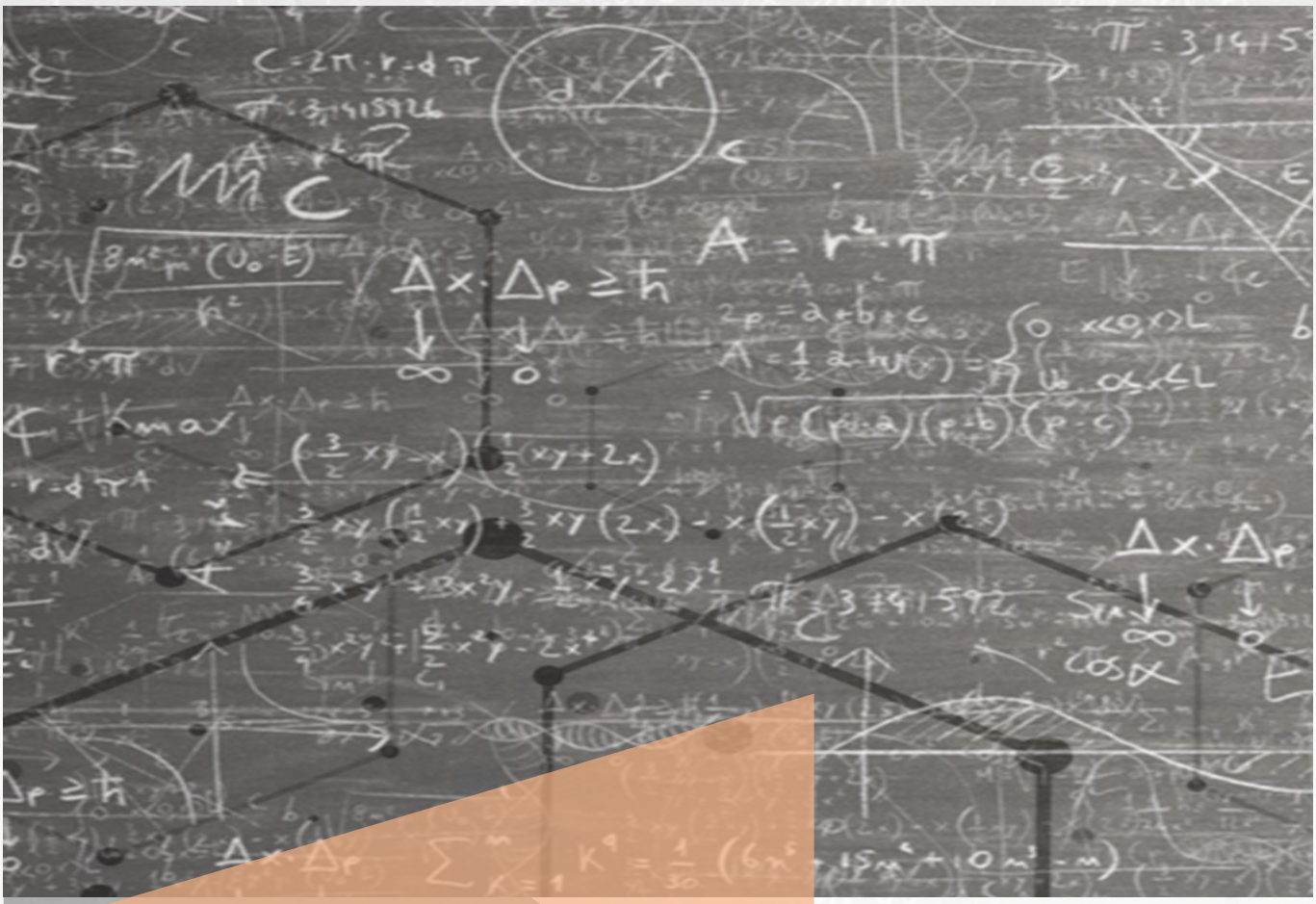
Syringe and plastic tube will be used to lift up the drawbridge and as the measuring tools to calculate the force (Pascal principle)</td></tr>
<tr><td>W4</td><td rowspan="2">Each group have to suggest and draw a design of a drawbridge and relate the design with the knowledge of trigonometric functions which consist of:

• distance of the bridge
• drawing/lifting angle of the bridge to let the ship move through it

The design measurement must be logic to make sure the students able to build the prototype in Science Mini Project.</td><td></td></tr>
<tr><td>W5</td><td>Students have to
• submit the drawbridge design with correct dimension from presentation 1, DBM10013
• submit material & cost</td></tr>
<tr><td>W6</td><td>Presentation of PowerPoint slides and video.
• Lecturer refer to the rubric to assess</td><td>Students submit project description & objectives</td></tr>
<tr><td>W7</td><td rowspan="6"></td><td rowspan="2">Students build the drawbridge prototype

• Prepare the label and dimension of the prototype
• Do the calculation on force and the lifting distance of the bridge (Pascal Principle)</td></tr>
<tr><td>W8</td></tr>
<tr><td>W9</td><td rowspan="2">Prototype demonstration
• Explain the concepts and operation of the design.
• State whether the project met the design criteria.</td></tr>
<tr><td>W10</td></tr>
<tr><td>W11</td><td>Submit analysis & impact
• students need to analyse whether the pascal principles studied theoretically can be proved in practice</td></tr>
<tr><td>W12</td><td>Submit completed PowerPoint slides</td></tr>
</table>

NOTES OF GUIDANCE



SEMESTER 1

DBM10013 – ENGINEERING MATHEMATICS 1

JABATAN MATEMATIK, SAINS DAN KOMPUTER /
***DEPARTMENT OF* MATHEMATICS, SCIENCE AND COMPUTER**
RANGKA KURSUS/ *COURSE OUTLINE*
SESI DIS 2020/ DEC 2020 SESSION

1.	NAME OF COURSE	ENGINEERING MATHEMATICS 1
	COURSE CODE	DBM10013
2.	SYNOPSIS	ENGINEERING MATHEMATICS 1 exposes students to the basic algebra including resolve partial fractions. This course also covers the concept of trigonometry and the method to solve trigonometry problems by using basic identities, compound angle and double angle formulae. Students will be introduced to the theory of complex number and concept of vector and scalar. Students will explore advanced matrices involving 3x3 matrix.
3.	CREDIT VALUE	3
4.	PREREQUISITE/ CO-REQUISITE (IF ANY)	None
5.	COURSE LEARNING OUTCOMES (CLO): Upon completion of this course, students should be able to:	
	CLO1	Use mathematical statement to describe relationship between various physical phenomena. (C3, CLS 1)
	CLO2	Show mathematical solutions using the appropriate techniques inmathematics. (C3, CLS 3c)
	CLO3	Use mathematical expression in describing real engineering problems precisely,concisely and logically. (A3, CLS 3b)
	PROGRAMME LEARNING OUTCOMES (PLO): PLO 001: Apply knowledge of applied mathematics, applied science, engineering fundamentals and engineering specialization as specified in DK1 to DK4 respectively to wide practical procedures and practices. PLO 005: Apply appropriate techniques, resources and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6) PLO 010: Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions	
6.	ASSESSMENT METHOD: The course assessment consists of: i. Continuous Assessment (CA) –60% ii. Final Examination (FE) – 40%	

Assessment	Quantity	Percentage (%)
Quiz	2	10%
Test	1	15%
Presentation	2	15%
End of Chapter	3	20%

7. TEACHING SCHEDULE:

Topic No.	Topic / Content	Recommended Contact Hours	Assessment Method	Week
1.0	Basic Algebra 1.1 Simplify basic algebra 1.2 Solve quadratic equations 1.3 Procedures to find partial fraction	6 hours Lecture 4 hours Tutorial	Quiz 1 End of Chapter 1	W2 W3
2.0	Trigonometry 2.1 Solve the fundamental of trigonometry functions 2.2 Solve trigonometry equations and identities 2.3 Apply sine and cosine rules	6 hours Lecture 5 hours Tutorial	Test 1 (Q1) Presentation 1	W8 W3
3.0	Complex Numbers 3.1 Explain the concept of acomplex number 3.2 Demonstrate the operation of complex number 3.3 Demonstrate graphical representation of a complex number through Argand Diagram 3.4 Write complex number in other forms	5 hours Lecture 4 hours Tutorial	End of Chapter 2 Test 1 (Q2)	W7 W8
4.0	Matrices 4.1 Construct Matrices 4.2 Demonstrate the operation of Matrices 4.3 Demonstrate simultaneous linear equations	4.5 hours Lecture 4.5 hours Tutorial	Quiz 2 End of Chapter 3	W9 W10
5.0	Vector and Scalar 5.1 Express vector 5.2 Demonstrate the operation of vector 5.3 Apply scalar (dot) product of two vectors 5.4 Apply vector (cross) product of two vectors	5 hours Lecture 5.5 hours Tutorial	Presentation 2	W12

8.	REFERENCES Main reference supporting the course Bird, J. (2017). Higher Engineering Mathematics. (8th Edition). New York, NY: Routledge. Additional references supporting the course Croft A. and Davison R. (2019). Mathematics for Engineers (5th Edition). London, UK: Pearson. Larson, R. and Edwards, B. (2018). Calculus. (11th Edition). Boston, MA. Cencage Learning. P. M. Cohn (2017). Algebraic Numbers and Algebraic Functions. Taylor & Francis Ltd. Zuraini Ibrahim, Suria Masnin, Fatin Hamimah, Mohamed Salleh, Myzatul Mansor dan Baharudin Azit (2018). Engineering Mathematics 2. Shah Alam: Oxford Fajar Sdn. Bhd

Prepared by:

……

(NORHALIDAH BINTI YUNUS)

Date :5 Mac 2021

Verified by :

Fadhliana binti Mohamod
Ketua Kursus Matematik
Jabatan Matematik, Sains & Komputer
Politeknik Port Dickson

……

(KJ/KPro/KK Name & Signature **)**

Date: 7 Mac 2021

DEPARTMENT OF MATHEMATICS, SCIENCE & COMPUTER

SESSION: DECEMBER 2020

DBM10013 – ENGINEERING MATHEMATICS 1

PRESENTATION 1

CLO 3	*: Use mathematical expression in describing real engineering problems precisely, concisely and logically. (A3)*
CLS3b	*: Interpersonal & Communications Skills*
Topic	*: Trigonometry*
Subtopic	*: Solve the fundamental of trigonometric functions and solve trigonometry equations and identities*
Weightage	*7.5 %*
Evaluation	*Base on Rubric Presentation for DBM10013*
Method of Submission	*Slide PowerPoint and Video*

To complete this presentation, all students have to follow the instructions below:

1. Form a group of 3-4 students (the group members must follow the members in Engineering Science DBS10012 mini project)

2. Presentation must consist at least 5 PowerPoint slides

Slide 1: Group division and task description

Write the name of each of the group member and state the task description for each member.

Slide 2: Introduction

Refer to **Figure 1** the Tower Bridge in London below (or any other bridge that use the same operating system), write your introduction consists of:

- brief history
- purpose of the design
- location
- design, material
- operation of the bridge (hydraulic system, traffic)
- structure dimension (length, tower height, raise angle, clearance, etc.)

  -explain the design and the operation of the draw bridge and relate it with yourknowledge in trigonometry and engineering.

Figure 1

Slide 3: Designing bridge

Design a drawbridge (Tower Bridge) to replace any existing bridge.
The design has to be realistic to be develop in Engineering Science Mini Project (DBS10012). Show the design by using diagram and made appropriate ratio for the drawbridge thatconsist:

- distance of the bridge
- the height of two main pylon
- lifting angle of the bridge and the size of vessel that can go through the bridge

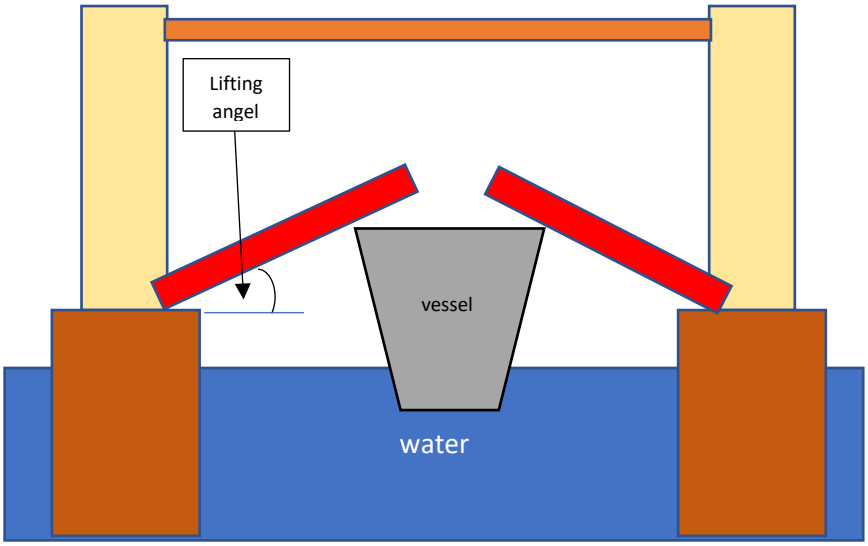


Figure 2

Slide 4: New angle calculation

Refer to the design in **Slide 3,** calculate new angle that will affect the width and the height of the route to allow ships of different sizes to pass through it.

Slide 5: Impact

Give the impact of drawbridge and write a conclusion.

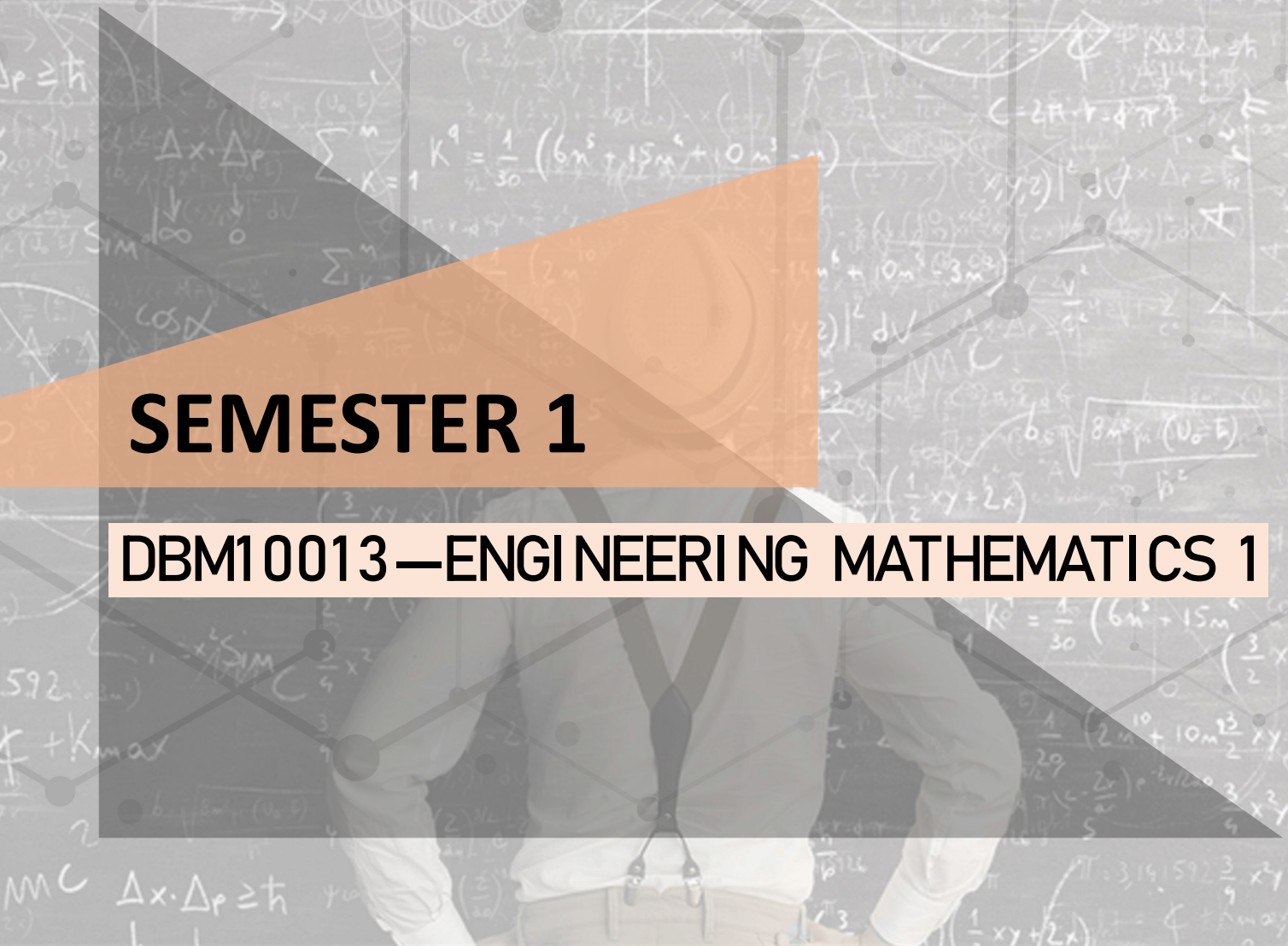
3. Prepare a 10-15-minute video presentation to present the idea.

Prepared by:	Verified by:	Approved by:
…… (NORHALIDAH BINTI YUNUS) Date: 3 Mac 2021	…… (SUHANA BINTI RAMLI) Date : 5/3/2021	…… (FADHLIANA BINTI MOHAMOD) Date : 29/3/2021 Fadhliana binti Mohamod Ketua Kursus Matematik Jabatan Matematik, Sains & Komputer Politeknik Port Dickson

RUBRICS

SEMESTER 1

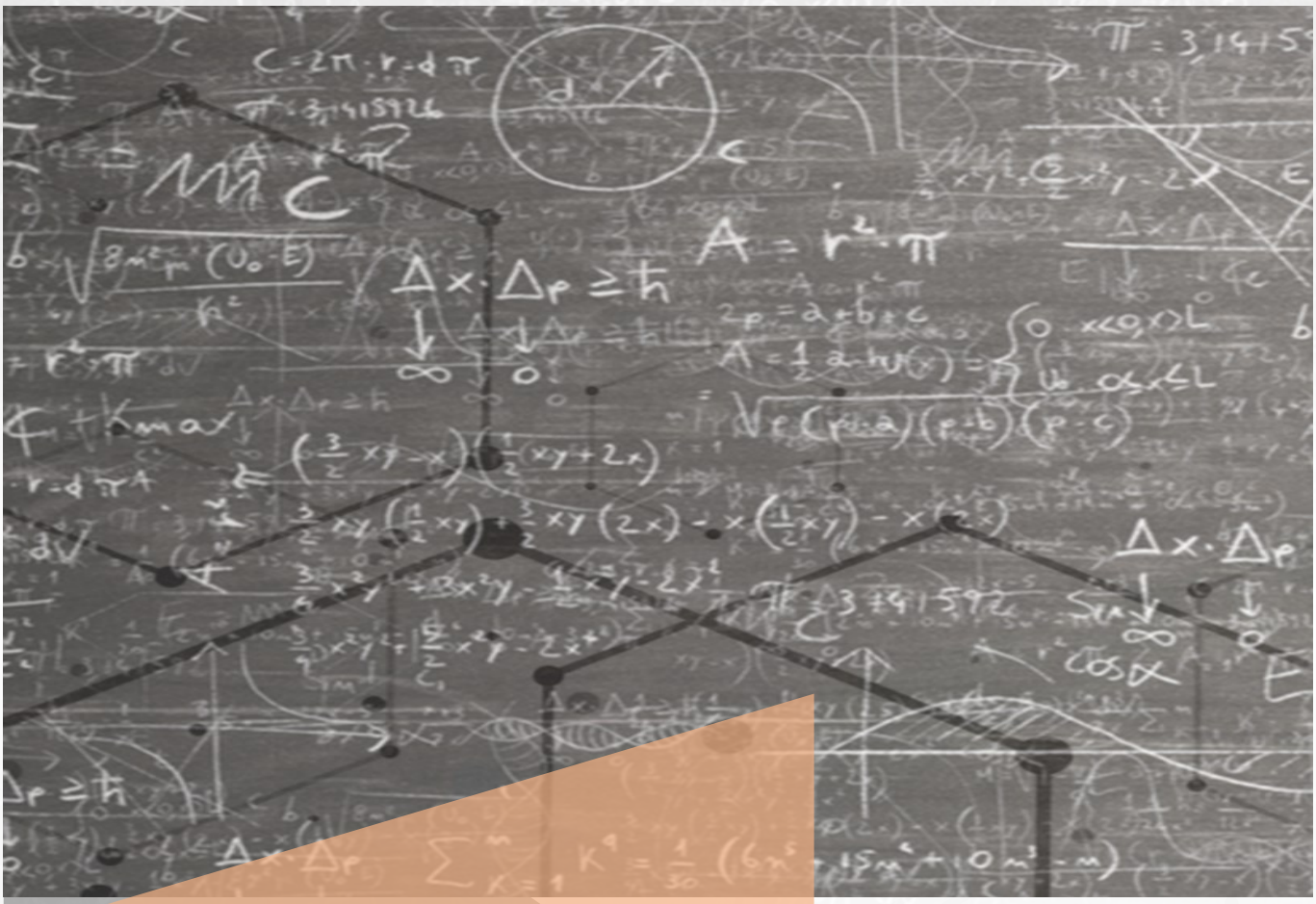
DBM10013 – ENGINEERING MATHEMATICS 1



RUBRIC OF PRESENTATION 1 (7.5%)

CRITERIA	VERY GOOD (4 MARKS)	GOOD (3 MARKS)	WEAK (2 MARKS)	VERY WEAK (1 MARK)	WEIGH-TAGE	SCORES
COMMITMENT • Interest	• Demonstrate interest in engineering mathematical problems effectively with suitable example.	• Demonstrate interest in engineering mathematical problems effectively.	• Demonstrate interest in engineering mathematical problems moderately.	• Demonstrate interest in engineering mathematical problems poorly.	**10%**	**Example: (2/4) x 10%**
TEAMWORK • Good relationship • Work Together	• Demonstrate high ability to foster good relationship and work together effectively towards goal achievement.	• Demonstrate ability to foster good relationship and work together towards goal achievement.	• Demonstrate ability to foster relationship and work together towards goal achievement and require minor movements.	• Demonstrate ability to foster relationship and work together towards goal achievement but require minor improvements.	**10%**	**Example: (2/4) x 10%**
APPEARANCE/ VOICE • Proper Attire • Volume • Clarity	• Show physical appearance most appropriately. • Speaks clearly and distinctly all the time.	• Show physical appearance appropriately. • Speaks clearly and distinctly at Most of the time.	• Show physical appearance less appropriately. • Speaks unclearly and indistinctly Most of the time.	• Show physical appearance inappropriately. • Speaks unclearly and indistinctly all the time.	**20%**	**Example: (2/4) x 20%**
CONTENT /CALCULATION • Mathematical Representation (expression, diagrams, graphs, tables, others) • Solve trigonometry function	• Analyze mathematical representations accordingly and clearly explain. • Demonstrate ability to solve the fundamental of trigonometry functions correctly, concisely and logically.	• Analyze mathematical representations accordingly. • Demonstrate ability to solve the fundamental of trigonometry functions correctly and logically.	• Analyze mathematical representations less accordingly. • Demonstrate ability to solve the fundamental of trigonometry functions correctly.	• Analyze mathematical representations disorderly. • Demonstrate ability to solve the fundamental of trigonometry functions but need to be corrected.	**40%**	**Example: (2/4) x 40%**
VIDEO PRESENTATION /INTERVIEW • Respond to question	• Demonstrate ability to fully understand and respond to questions very well	• Demonstrate ability to understand and respond to questions so Well.	• Demonstrate ability to understand and respond to questions satisfactorily.	• Demonstrate ability to understand and respond to questions poorly	**20%**	**Example: (2/4) x 20%**
TOTAL SCORE						/100

NOTES OF GUIDANCE



SEMESTER 1

DBS10012 – ENGINEERING SCIENCE

JABATAN MATEMATIK, SAINS DAN KOMPUTER /
DEPARTMENT OF MATHEMATICS, SCIENCE AND COMPUTER
RANGKA KURSUS/ *COURSE OUTLINE*
SESI DISEMBER 2020 / *DECEMBER 2020 SESSION*

<table>
<tr><td rowspan="2">1.</td><td>NAME OF COURSE</td><td>ENGINEERING SCIENCE</td></tr>
<tr><td>COURSE CODE</td><td>DBS10012</td></tr>
<tr><td>2.</td><td>SYNOPSIS</td><td>ENGINEERING SCIENCE course introduces the physical concepts required in engineering diciplines. Students will learn the knowledge of fundamental physics in order to identify and solve engineering physics problems. Students will be able to perform experiments and activities to mastery physics concepts.</td></tr>
<tr><td>3.</td><td>CREDIT VALUE</td><td>2</td></tr>
<tr><td>4.</td><td>PREREQUISITE/
CO-REQUISITE (IF ANY)</td><td>None</td></tr>
<tr><td rowspan="5">5.</td><td colspan="2">COURSE LEARNING OUTCOMES (CLO):
Upon completion of this course, students should be able to:</td></tr>
<tr><td>CLO1</td><td>Use basic physics concept to solve engineering physics problems. (C3, PLO1)</td></tr>
<tr><td>CLO2</td><td>Apply knowledge of fundamental physics in activities to mastery physics concept (C3, PLO1)</td></tr>
<tr><td>CLO3</td><td>Perform appropriate activities related to physics concept. (P3, PLO5)</td></tr>
<tr><td colspan="2">PROGRAMME LEARNING OUTCOMES (PLO):
PLO 1 : Apply knowledge of applied mathematics, applied science, engineering fundamentals and engineering specialization as specified in DK1 to DK4 respectively to wide practical procedures and practices.

PLO 2 : Identify and analyze well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4).</td></tr>
<tr><td>6.</td><td colspan="2">ASSESSMENT METHOD:
The course assessment consist of:

i. Continuous Assessment (CA) – 60%
ii. Final Examination (FE) – 40%

<table>
<tr><th>Assessment</th><th>Quantity</th><th>Percentage (%)</th></tr>
<tr><td>Test</td><td>1</td><td>20%</td></tr>
<tr><td>Lab Work</td><td>3</td><td>15%</td></tr>
<tr><td>Mini Project</td><td>1</td><td>25%</td></tr>
</table>
</td></tr>
</table>

7. TEACHING SCHEDULE:

Topic No.	Topic/Content	Recommended Contact Hours	Assessment Method	Week
1.0	PHYSICAL QUANTITIES AND MEASUREMENT 1.1 Define the physical quantities 1.2 Define measurement and errors in measurement 1.3 Solve problems of unit conversion 1.4 Interpret readings of measurement tools	4 hours Lecture		W1 - W2
2.0	LINEAR MOTION 2.1 Apply the concept of linear motion 2.2 Solve problems of linear motion from velocity-time graph 2.3 Carry out an experiment related to linear motion of an object	3 hours Lecture 1 hour Practical	Lab Work 1	W2 - W3
3.0	FORCE 3.1 Apply the concept of force 3.2 Apply the concept of moment of force	5 hours Lecture	Test	W4 - W5
4.0	WORK, ENERGY AND POWER 4.1 Apply the concept of work 4.2 Explain the renewable energy 4.3 Apply the concept of energy 4.4 Apply the concept of power 4.5 Carry out an activity related to work, energy and power.	5.5 hours Lecture 3.5 hours Practical		W6 - W8
5.0	SOLID AND FLUID 5.1 Apply the concept of solid and fluid 5.2 Apply the concept of Pascal's Principle 5.3 Apply the concept of Archimedes' Principle 5.4 Carry out an experiment related to buoyant force	6.5 hours Lecture 2.5 hours Practical	Lab Work 2 Mini Project	W9 - W12
6.0	TEMPERATURE AND HEAT 6.1 Define the concept of temperature and heat 6.2 Apply the concept of heat energy 6.3 Carry out an experiment related to thermal equilibrium	3 hours Lecture 1 hours Practical	Lab Work 3	W13 - W14

8.	REFERENCES	**Main reference supporting the course** Azia Idayu Awang, Azhari Zakaria, Hardyta Bujang Pata, Khairani Yaakub, Noor Affande Abdul (2015). *Engineering Science, Polytehcnic Series*. Shah Alam: Oxford Fajar Sdn. Bhd **Additional references supporting the course** Lee, B.H and Poh L.Y (2016). *Physics for Matriculation Semester 1 Fifth Edition*. Shah Alam: Oxford Fajar Sdn. Bhd

Prepared by:

.....

(MOHD SAIFUL BIN PAHRUDIN)

Date :7 Mac 2021

Verified by :

Noorain binti Ithnin
Ketua Kursus
Jabatan Matematik, Sains & Komputer
Politeknik Port Dickson

.....

(KJ/KPro/KK Name & Signature **)**

Date : 7/3/2021

MINI PROJECT
DBS10012

DECEMBER 2020

Prepared by :	Verified by :	Approved by :
Mohd Saiful bin Pahrudin	Syafarizan Binti Nasroddin	Noorain Binti Ithnin
Date: 5 / 4 / 2021	Date: 5 / 4 / 2021	Date: 5/4/2021

Noorain binti Ithnin
Ketua Kursus
Jabatan Matematik, Sains & Komputer
Politeknik Port Dickson

THEME
DRAWBRIDGE

CLO2 : Apply knowledge of fundamental physics in activities to mastery physics concept

Weightage: 25%

Group members: 3 to 4 students

Discussion with lecturer: Minimum 5 times

(refer student lecturer meeting log sheet)

Topic: Solid and Fluid (Chapter 5)

Method of submission: Project poster in ***slide presentation***

Method of evaluation: Based on rubrics (marking criteria)

MINI PROJECT PRESENTATION TEMPLATE & DESCRIPTIONS

SLIDE 1:
PROJECT DESCRIPTION

PROJECT DESCRIPTION

- The introduction
- Describe the purpose of your project or invention
  (must be related to the topic chosen)

SLIDE 2:
OBJECTIVE

OBJECTIVE

- Based on topics and theme of Mini Project

MINI PROJECT PRESENTATION TEMPLATE & DESCRIPTIONS

SLIDE 3:
DIAGRAM

DIAGRAM

- Draw the design of the Mini Project
- Prepare the label and dimension completely
- Show the picture of the Mini Project

SLIDE 4:
MATERIAL & COST

MATERIAL & COST

- List the material used in the project
- State the quantity and cost for each material

  (Students are encourage to

  use recycle materials)

Example:

NO.	ITEMS	QUANTITY	COST

MINI PROJECT PRESENTATION TEMPLATE & DESCRIPTIONS

SLIDE 5:
RESULT & DISCUSSION

RESULT & DISCUSSION

- Prepare the picture of the Mini Project
- Explain the concepts and operation of the design.
- State whether the project met the design criteria.
- State and discuss any problems occurred while conducting the project.

SLIDE 6:
IMPACT

IMPACT

State the future contribution of the project to the area you worked in or in real life.

Example:
Application of the structure designed can be applied as ....

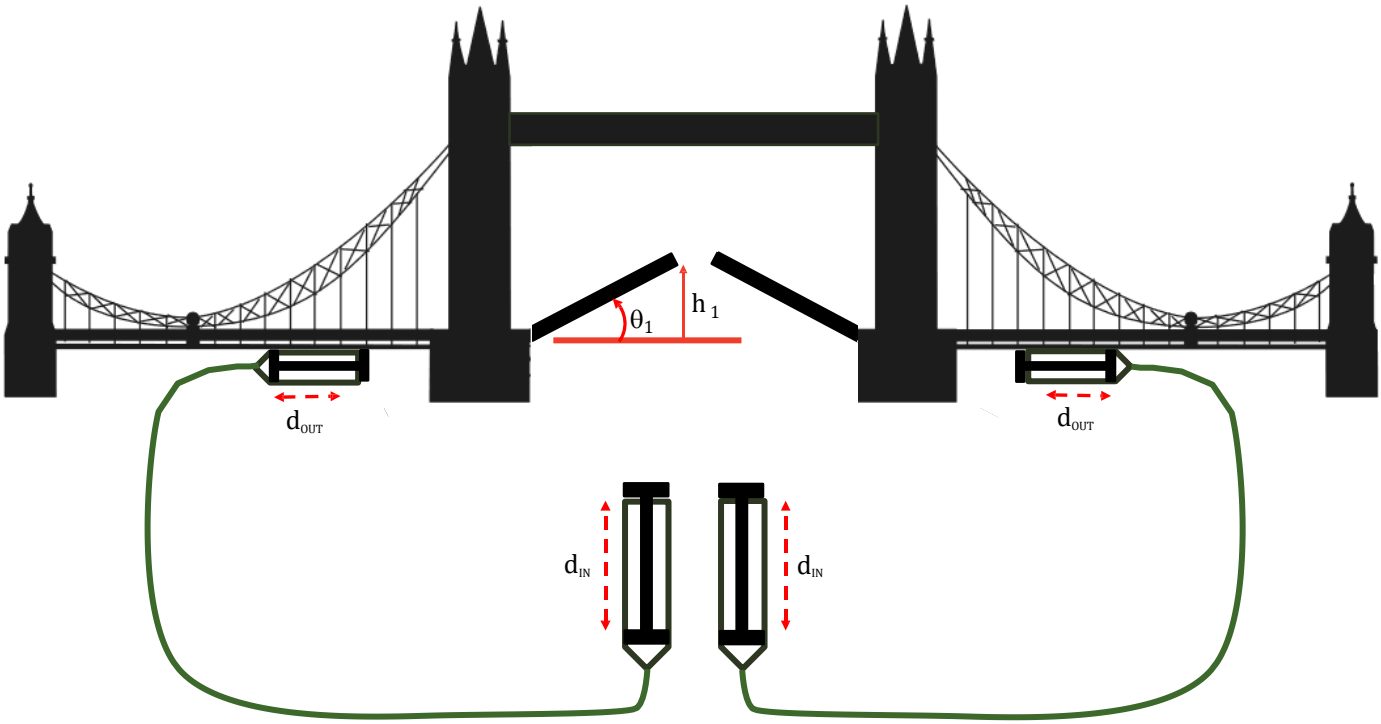
DRAWBRIDGE REQUIREMENTS

1. The Mini Project Drawbridge must replicate the actual drawbridge

2. The bridge can :
    - operate simultaneously (if possible)
    - be lift up and down

3. The operation – basic concepts of Pascal's Principle.
    - The bridge is operate using syringe as the main controller
    - No maximum number of syringe can be used (with no limit size/ volume of syringe)
    - Different pressure of input will be given to get a different level lifted by the bridge (minimum 3 input pressure)
    - The output result is the output volume of the syringe.

4. The data and result
    - Student need to set the input pressure position (d_{in} at **position d_1, d_2, d_3**) – representing the input pressure value, calculate
        - the **input volume** from Syringe 1.
    - Student need to **measure and calculate the output volume** position (d_{out} at **d_{o1}, d_{o2}, d_{o3}**) – the different output present
    - Student need to **measure the high** (h, at **h_1, h_2, h_4**) **and the angle** (θ, at θ_1, θ_2, θ_4) **of the bridge lifted** – these result will be used in Engineering Mathematics 1 analysis



TRIAL PRESSURE	INPUT (d_{in})			OUTPUT (d_{out})		
	AREA (S1)	PRESSURE POSITION	VOLUME	AREA (S2)	PRESSURE POSITION	VOLUME
P1	A_{S1}	d_1	V_1	A_{S2}	d_{01}	V_{01}
P2		d_2	V_2		d_{02}	V_{02}
P3		d_3	V_3		d_{03}	V_{03}

* BRIDGE POSITION		
RESULT	HIGH, h	ANGLE, θ
RESULT 1	h_1	θ_1
RESULT 2	h_2	θ_2
RESULT 3	h_3	θ_3

RUBRICS

SEMESTER 1

DBS10012 – ENGINEERING SCIENCE

POLITEKNIK PORT DICKSON

MATHEMATICS, SCIENCE AND COMPUTER DEPARTMENT

DBS10012 - ENGINEERING SCIENCE

MINI PROJECT

(To be filled up by Student)

No	Registration Number	Student's name
1		
2		
3		
4		
Title		
Class		
Lecturer's Name		

(To be filled up by Lecturer)

Criteria		Marks
1	Poster Content	/ 24
2	Knowledge	/ 4
3	End Product	/ 2
Total Marks		/ 30
Date of Submission		
Lecturer's Comment		

RUBRIC OF MINI PROJECT	
POLITEKNIK MALAYSIA PORT DICKSON	**POLITEKNIK PORT DICKSON**
CODE & COURSE	**DBS10012 ENGINEERING SCIENCE**
ASSESSMENT	**MINI PROJECT**

TASK DESCRIPTION

CLO	INSTRUMENT	WEIGHTAGE	DETAILS
CLO 2: Apply knowledge of fundamental physics in activities to mastery physics concept	RUBRIC	25%	• Conduct in a group consist of three (3) to four (4) students. • Minimum 5 times discussion with lecturer • Cover either topic 4 (Work, Energy and Power) or topic 5 (Solid and Fluid). • Students need to prepare Project Poster by referring to Mini Project Poster Template and rubric (Mini Project Evaluation Form). • Students are encourage applying green technology and cost effective product.

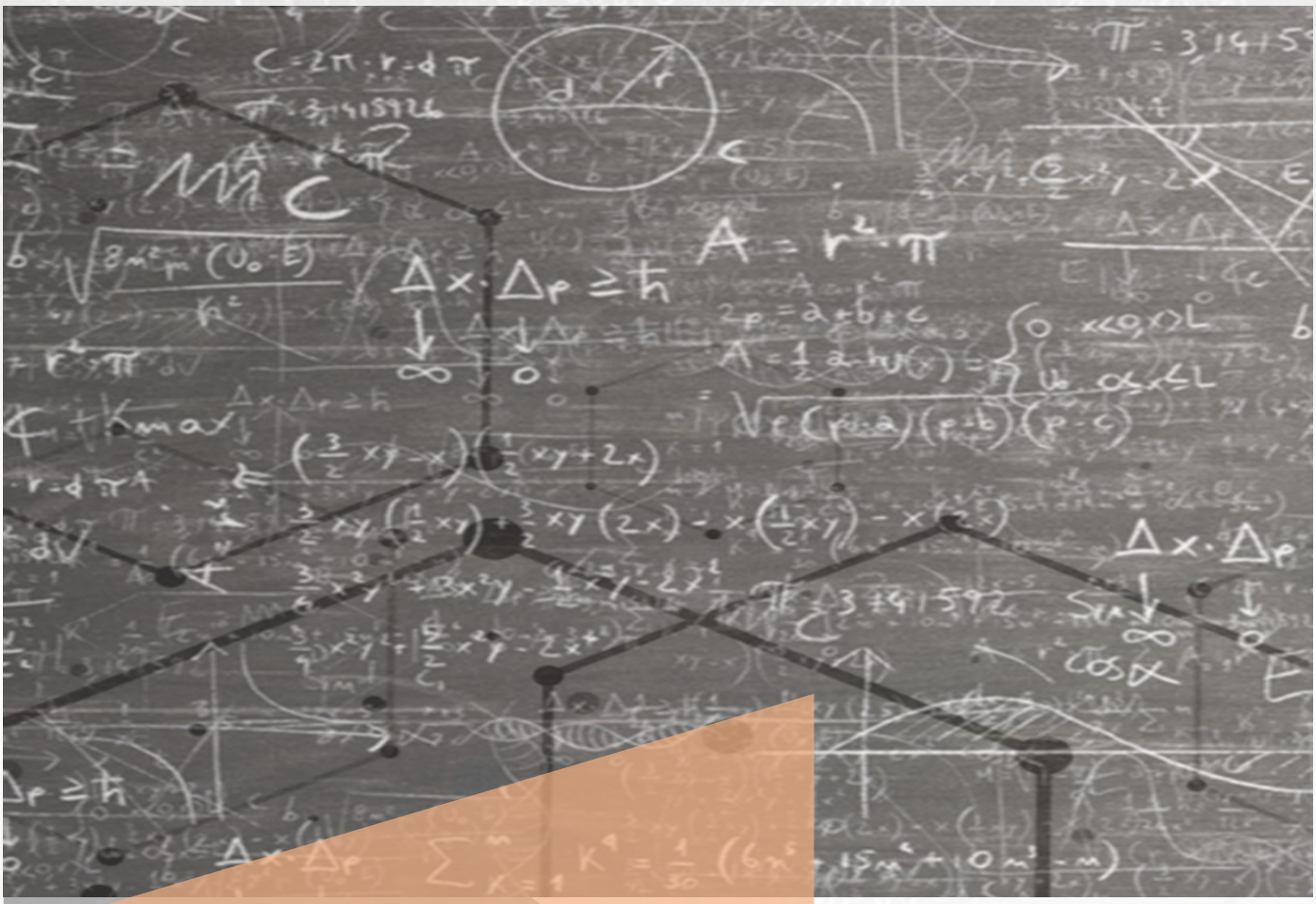
MINI PROJECT POSTER TEMPLATE

(i) Project Description	**(iv) Material and Cost**
(ii) Objective	**(v) Results and Discussion**
(iii) Diagram	**(vi) Impact**

MINI PROJECT EVALUATION FORM

CRITERIA	Excellent [4]	Good [3]	Satisfactory [2]	Unsatisfactory [1]
POSTER CONTENT	Information is clearly stated and presented in a **logical AND interesting way**, which is **easy to understand**.	Information is clearly stated and presented in a **logical AND interesting way**.	Information is clearly stated and presented in a **logical OR interesting way**.	Sequence of information is **difficult to follow**, as there is very limited continuity.
(i) Project Description				
(ii) Objective				
(iii) Diagram				
(iv) Material and Cost				
(v) Results and Discussion				
(vi) Impact				
Total Marks (Poster Content)	/ 24			
KNOWLEDGE	Explain Physic Concepts **correctly** with **high level of confident.**	Explain Physic Concepts **correctly** with **confidence.**	Explain Physic Concepts **correctly** with **low confidence.**	Explain Physic Concepts **incorrectly.**
Related to Physic Concept				
END PRODUCT			Able to function well. Student **adapts others' ideas to create own design.**	Able to function well. **Student fully adapts others' ideas.**
Function and Creativity				

OUTCOME



SEMESTER 1

DBM10013—ENGINEERING MATHEMATICS 1

DBS10012—ENGINEERING SCIENCE

DBM10013- ENGINEERING MATHEMATICS

PRESENTATION 1

Figure 1

STRUCTURE DIMENSION

- *Width-18.3m*
- *Length-286.5m*
- *Spans-Main spans 60.96m side spans 82.3m*
- *Height of footbridge between towers-43m*

HISTORY OF THE BRIDGE.

The first "London Bridge" was built by the Romans in 43 A.D. They built a temporary pontoon bridge which was planks laid across a row of anchored boats, or they may have used ferry boats.

OPERATION SYSTEM

The operation system of this London bridge using combination of bascule and suspension bridge.

PURPOSE OF BRIDGE.

- The Tower Bridge was designed to ease road traffic while preserving access to a main stretch of the River Thames.
- A traditional fixed bridge at street level could not be built because it would cut off access for many tall ships.

BRIDGE LOCATION.

The abutments of modern London Bridge rest several metres above natural embankments of gravel, sand and clay. From the late Neolithic era the southern embankment formed a natural causeway above the surrounding swamp and marsh of the river's estuary; the northern ascended to higher ground at the present site of Cornhill.

The Existing Bridge

Figure 2

- Al Salam Bridge(Figure 2) at Suez Canal, the suspension bridge crossing the Suez Canal at El-Qantara, linking the continents of Africa and Asia.
- The bridge, which has a 70-metre clearance over the canal and is 3.9 kilometres long, consists of a 400-metre cable-stayed main span and two 1.8-kilometre long approach spans.
- The height of the two main pylons supporting the main span is 154 metres each.
- The clearance under the bridge is 70 metres, which allow the maximum height of ships that can pass through the Suez Canal at 68 metres above the waterline.

Location of the bridge

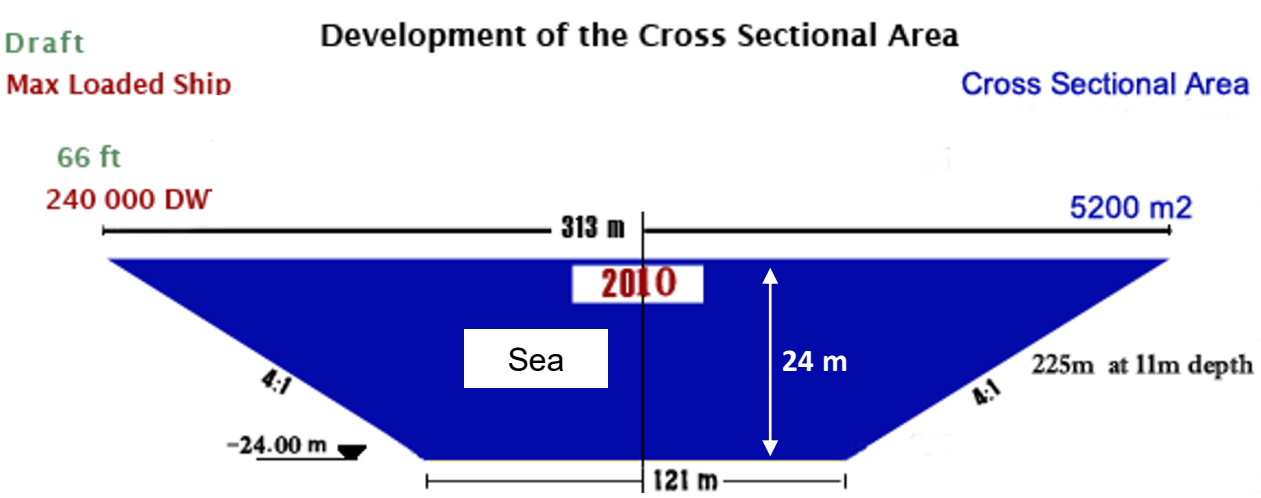


Figure 3

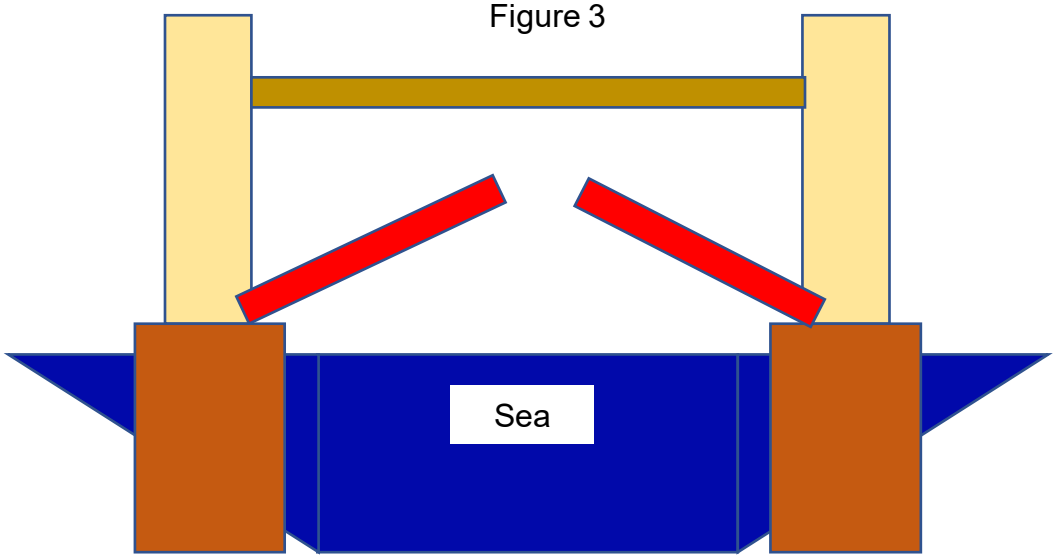


Figure 4

Overall Length (Km)	ByPasses Length (Km)	Width at 11 m depth (m)	Water depth Max. (m)
193.30	113.3	205/225	24

Draft of ship (Feet)	Cross Sectional Area (m^2)	Max. Loaded ship (DWT)
66	4800/5200	240000

Given the cross section area of the Suez Canal in Figure 3 and Table, the surface length is approximately 313 m, while the sea floor is 121 m. The average depth of the canal is about 24 m.

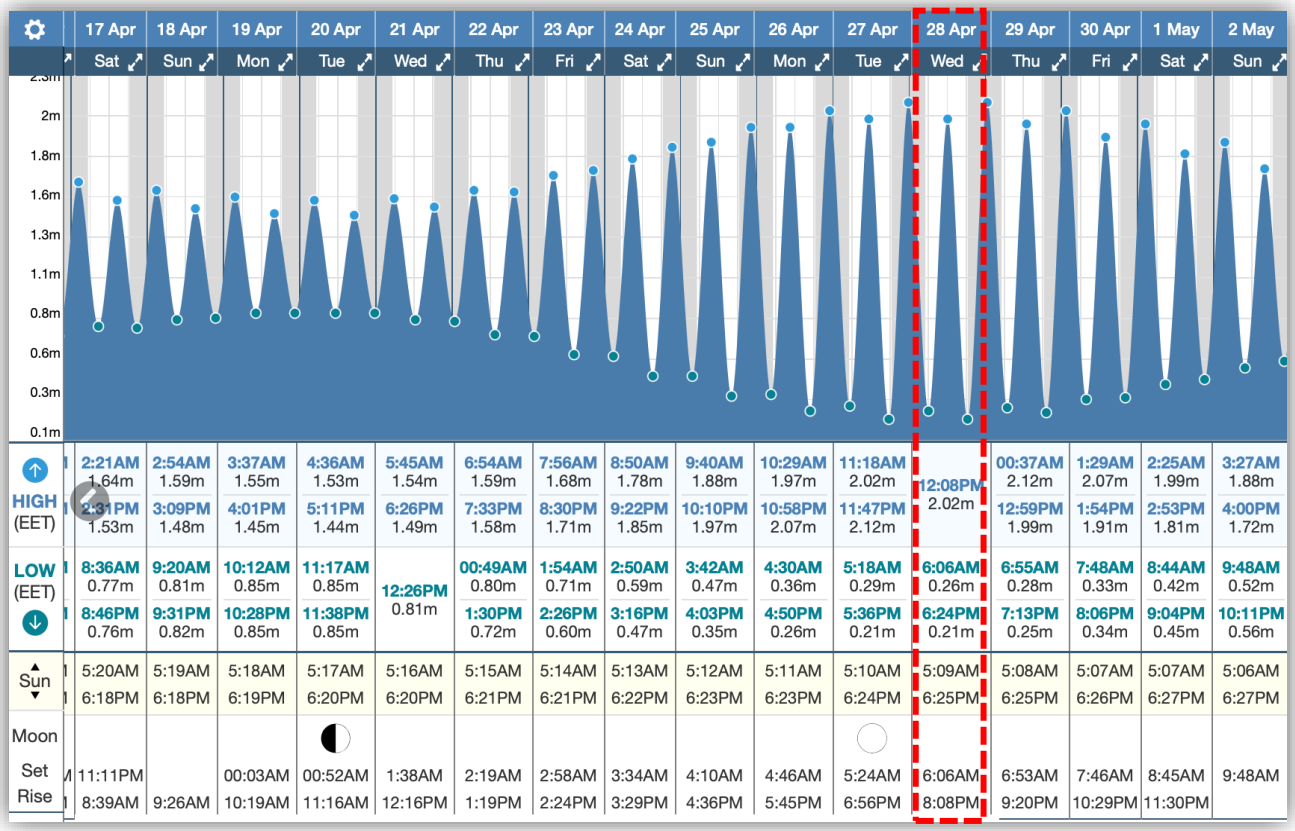
You're required to design a Tower Bridge as depicted in Figure 4.

Type of Vessel

- Capacity: 19,224 TEU
- Length: 395.4 m
- Breath: 59.0 m
- Height: 73 m
- Draft: 14.5 m
- Speed: 22.8 knots

Figure 5

High Tide and Low Tide

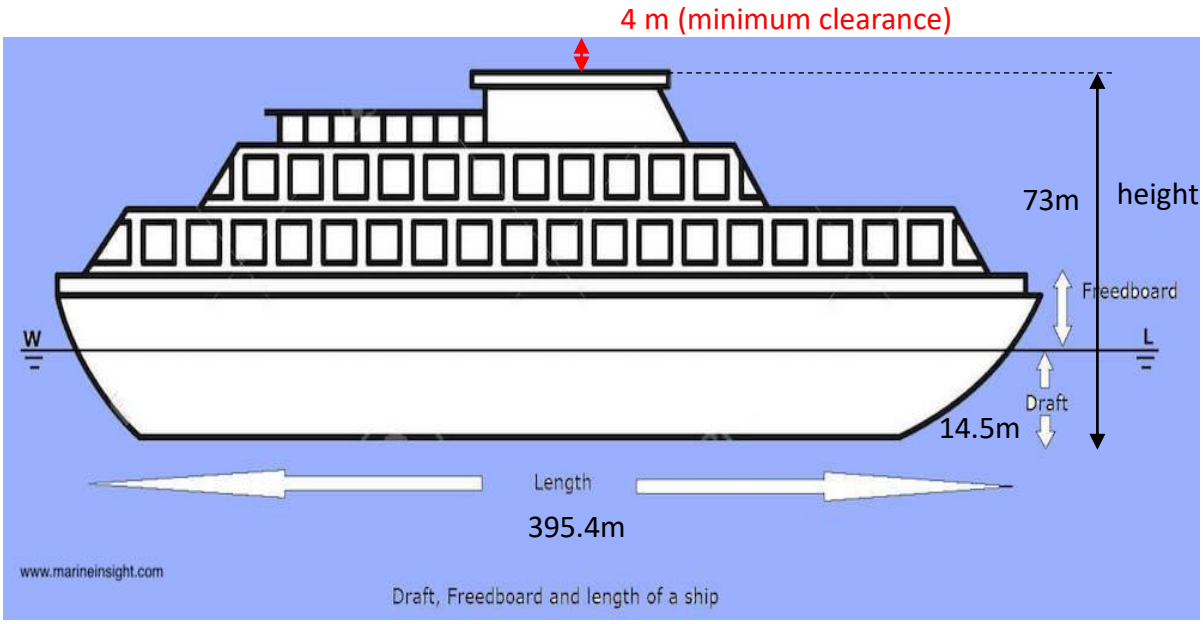


Given the High tide and low tide forecasts, estimate the depth of the sea water and the bridge clearance for your vessel.

Water depth = average depth + tide height

Example: Water depth (20 April) = 24 m (average depth) + 1.44 m = 25.44 m

Bridge Clearance



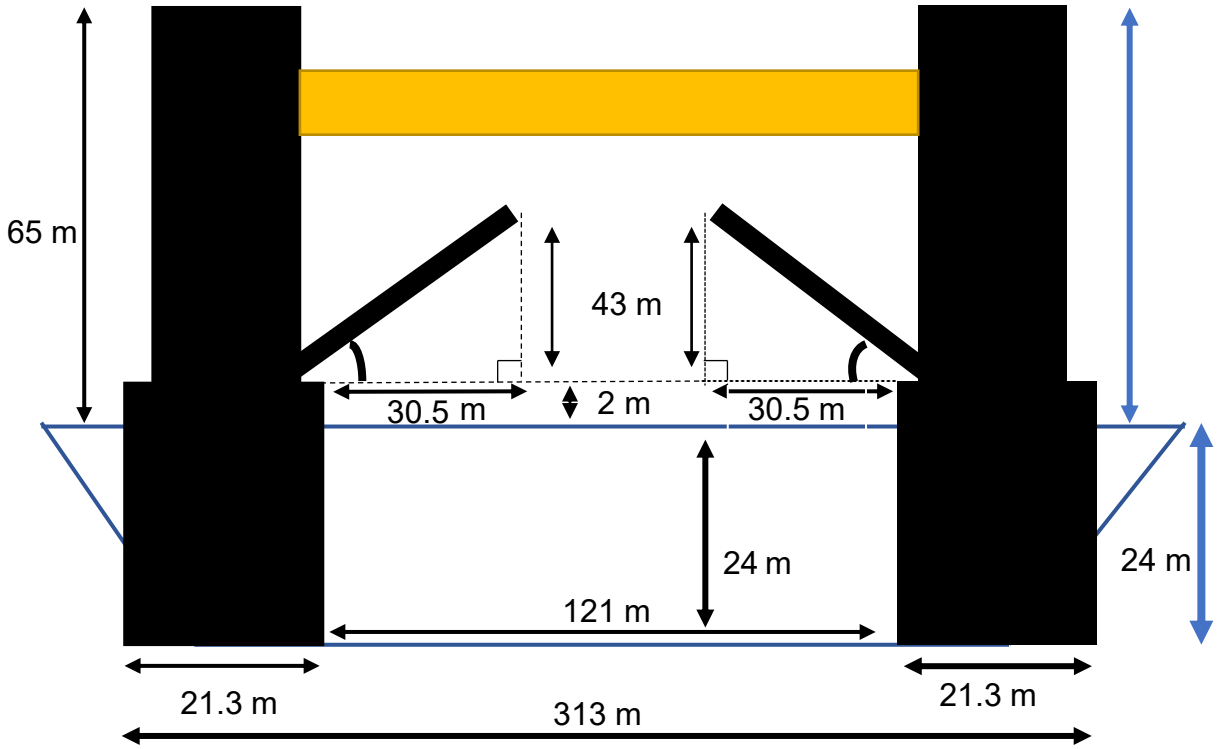
Vessel draft (or draught) is one of the principal dimensions of any waterborne vessel and is defined in technical terms as the distance between the ship's keel and the waterline of the vessel.

Note: Minimum vertical clearance of ship is at least 4 meters.

Bridge Clearance (meter) = vessel height – vessel draft + minimum clearance

Bridge Clearance = 73 m – 14.5m + 4 m = 62.5 m

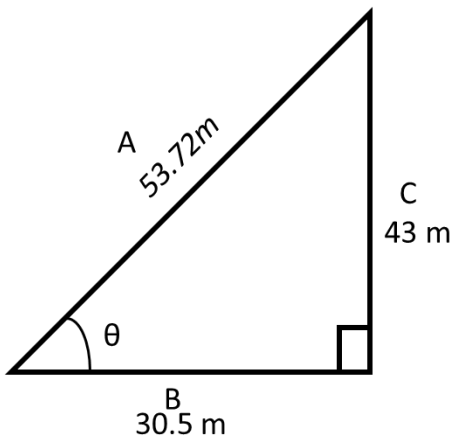
Bridge Design (Cross Section Drawing)



CALCULATION

- **Water depth = average depth + tide height**
  28 (April) = 24m + 2.02m = 26.2m.

- **Bridge Clearance (meter) = vessel height – vessel draft + minimum clearance**
  Bridge Clearance = 73 m – 14.5m + 4 m = 62.5 m

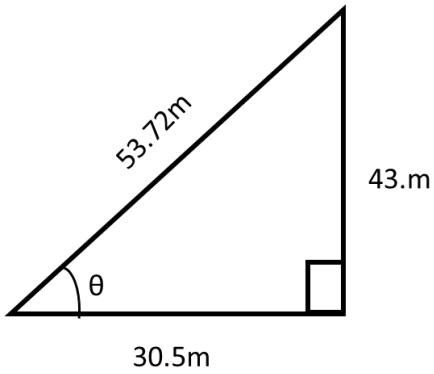


$a^2 = b^2 + c^2$

$a^2 = 30.5^2 + 43^2$

$a = \sqrt{2779.25}$

a=53.72



$\text{Cos } \theta = \frac{30.5}{53.72}$

$\Theta = \cos^{-1} \frac{30.5}{53.72}$

$= 55.4^{o}$

DBS10012- ENGINEERING SCIENCE

MINI PROJECT

PROJECT DESCRIPTION

The drawbridge we done is hydraulic bridge. It is order to allow traffic pass through a body of water that can be raised. The principle of this bridge is pascal's law. **Pascal's Principle** says that pressure applied to an enclosed fluid will be transmitted without a change in magnitude to every point of the fluid and to the walls of the container. The pressure at any point in the fluid is equal in all directions.

This design is a movable bridge by using hydraulic system.

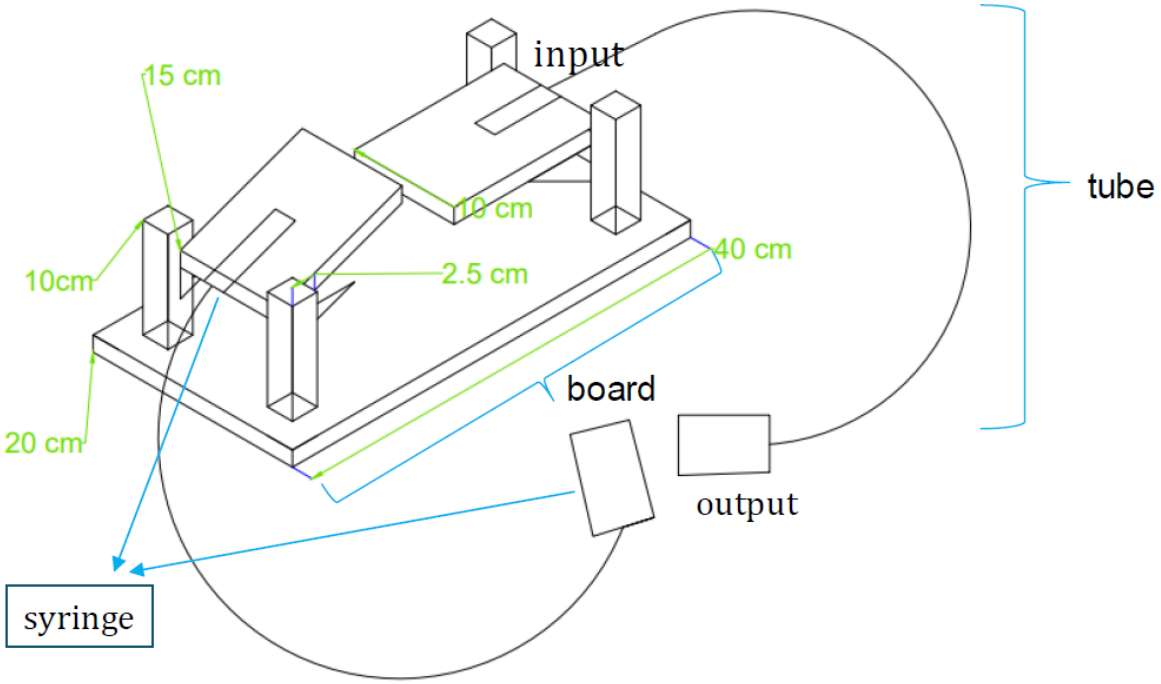
London tower bridge became our top choice as it is the most famous tower bridge in the world.

The bridge has its own charm that is a beautiful design.

OBJECTIVE

- To design a drawbridge based on London Tower Bridge design.
- To build the prototype of drawbridge by applying the concept of hydraulic system in Pascal’s principle.
- To measure and calculate the input volume position, output volume position, high and angle.

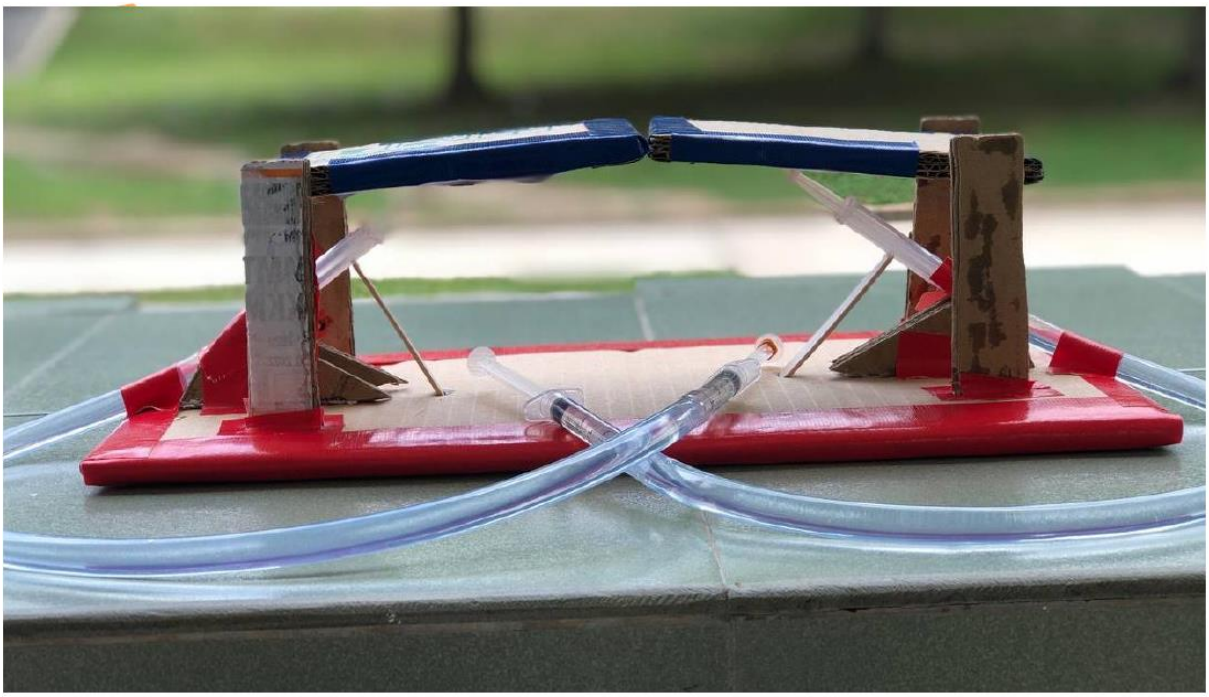
DIAGRAM



MATERIAL & COST

NO	ITEMS	QUANTITY	COST
1.	Tube (2 meter)	1	RM3.20
2.	Syringe	4	
3.	Glue	1	RM1.30
4.	Sticks (Recycle)	4	RM0
5.	Scissors (Recycle)	1	RM0
6.	Recycle Box	2	RM0
			TOTAL : RM4.50

RESULT



End Product of Drawbridge

TRIAL PRESSURE	INPUT (d_{in})			OUTPUT (d_{out})		
	AREA (S1) (cm^2)	PRESSURE POSITION (cm)	VOLUME (cm^3)	AREA (S2) (cm^2)	PRESSURE POSITION (cm)	VOLUME (cm^3)
P1	$A = \pi r^2$ $= (3.142 \times 0.5^2)$ $=0.785$	1.50	$V = A \times d_{in1}$ $= 0.785 \times 1.50$ $= 1.18$	$A = \pi r^2$ $= (3.142 \times 0.5^2)$ $=0.785$	1.00	$V = A \times d_{O1}$ $= 0.785 \times 1.00$ $=0.79$
P2		3.50	$V = A \times d_{in2}$ $= 0.785 \times 3.50$ $=2.75$		2.50	$V = A \times d_{O2}$ $= 0.785 \times 2.50$ $=1.96$
P3		5.20	$V = A \times d_{in3}$ $= 0.785 \times 5.20$ $=4.08$		4.50	$V = A \times d_{O3}$ $= 0.785 \times 4.50$ $=3.53$

RESULT	HIGH (cm)	ANGLE(◦)
RESULT 1	1.50	$\sin\theta = \frac{1.50}{15}$ $\sin\theta = 0.1$ $\theta = \sin^{-1} 0.1$ $\theta = 5.74$
RESULT 2	3.00	$\sin\theta = \frac{3.00}{15}$ $\sin\theta = 0.2$ $\theta = \sin^{-1} 0.2$ $\theta = 11.54$
RESULT 3	3.50	$\sin\theta = \frac{3.50}{15}$ $\sin\theta = 0.23$ $\theta = \sin^{-1} 0.23$ $\theta = 13.49$

- Our mini project is related to Pascal's Principle which is hydraulic system.
- In this system , pressure input and output are not the same because of the bubbles in the tube give an error in pressure readings.
- The drawbridge can lift up when the fluid flows from the input syringe to the output syringe because of the pressure in the enclosed syringe.
- The problem we met is cutting the boxes. It is because when we cut the box with scissor and blade, it become rough. It's not as accurate as we want. But at the end, we paste the colour paper on it by white glue to make it looks better.
- The drawbridge project has met the design criteria that we have planned in the diagram.

IMPACT

The impact from this mini project is we can see that the hydraulic system are majorly used in industrial control and transmission systems. A small amount of power can lift a big load. Our mini project is extremely used a simple ideas and mechanisms to achieve a complex set of actions and is intended to imitate the action of the London Bridge. We were able to apply the concept of Pascal’s Principle in building the drawbridge.

IMPACT

- Apply knowledge of applied mathematics and science for practical procedures and practices.

- Communicate effectively on well-defined engineering activities by being able to comprehend the work of others, document their own work, give and receive clear instructions

- Integrate some STEM subjects through a course of study to create a solution of a problem.

ROOM OF IMPROVEMENT

- Develop a standardize Notes of Guidance to ensure the course integration can be implemented in a well-planned.

- The work process has to be written clearly based on weekly requirement so that the students and lecturer can follow the time frame given.

- Thorough discussion must be conduct between courses coordinator and lecturer to make sure the learning process run smoothly.

REFERENCE

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