GUIDE BOOK

INTEGRATED DESIGN PROJECT

Engineering Programme

by

Integrated Design Project Committee

2nd Edition (September 2023)

FACULTY OF MECHANICAL
TECHNOLOGY AND ENGINEERING

Integrated Design Project Committee
2023-2024

Dr Abd Rahman bin Dullah. CEng MIMechE- (Chairman)
Dr Shafizal bin Mat
Dr Nazri bin Md Daud. P.Eng. (BEM), CEng MIMechE
Dr Mohd Nizam bin Sudin
Dr Mohd Asri bin Yusuff. P.Eng. (BEM), CEng MIMechE
Dr Mohd Shukri bin Yob. P.Eng. (BEM)
Ir Dr Siti Nurhaida binti Khalil. P.Eng. (BEM)
Dr Masjuri bin Musa@Othman
Dr Shamsul Anuar bin Shamsudin. CEng MIET

Purpose

This guidebook purpose is to provide the guidance to the lecturers and students on the IDP subjects.
The documents is to be updated when necessary.
Comments and opinion are welcomed.

TABLE OF CONTENTS

1. INTRODUCTION

The integrated design project is a group work in which students use an innovative and systematic method to design a solution for a real-world problem based on the integration of basic mechanical engineering and related engineering discipline knowledge. The solution will be in form of engineering product / process / system.

2. SUBJECTS

a. Semester 6

Engineering Design (ED)-BMCG3313-BMCG Programme
Integrated Design Project 1 (IDP1)-BMCK3013-BMCK Programme
Scopes;

- Design proposal
- Concept design
- Embodiment design
- Detail design

b. Semester 7

Integrated Design Project (IDP)-BMCU3013-BMCG Programme
Integrated Design Project 2 (IDP2)-BMCK3023-BMCK Programme
Scopes;

- Design refinement
- Prototype fabrication
- Prototype testing

3. LEARNING OUTCOMES

a) SEMSTER 6 (ED/IDP)	
LO1	Explain and apply an appropriate design method at the particular design phase in the course of developing a practical solution of an engineering design problem.
LO2	Develop a practical design solution through a systematic investigation of the engineering design problem.
LO3	Communicate effectively in written, oral and visual means in a technical setting

b) SEMESTER 7 (IDP/IDP2)	
LO1	Design solution by synthesizing mechanical engineering knowledge that will solve complex mechanical engineering problem in accordance with relevant standards.
LO2	Utilize modern engineering and IT tools in facilitating solutions to complex mechanical engineering problems with an understanding of the limitations.
LO3	Evaluate the impact of the design product, component or processes in term of safety, environmental and sustainability factors.
LO4	Demonstrate effectively teamwork skill in completing the IDP.
LO5	Apply project management and financial knowledge effectively in completing the IDP.

4. PROJECT

The topic for the projects

- Should relate to the following Sustainable Development (SDG) goals but not limited to;

  SDG6-Clean Water and Sanitation
  SDG7- Affordable and Clean Energy
  SDG9- Industry, Innovation and Infrastructure
  SDG11- Sustainable Cities and Communities

- based on specific product or specific user group
- to be proposed by the lecturers or students
- Specific theme will be decided by IDP Committee of the faculty
- The title for BMCG and BMCK will focus towards general mechanical and automotive application respectively.

The characteristic of the topics are as followings;

- Challenging-complex engineering problem
- Involve comprehensive engineering design work (at least 3 significant mechanical parts)
- Design can be analysed- (mathematical calculation, computer simulation)
- Prototype can be fabricated with
  -limited cost (RM350/group),
  - time (2 semester) and
  -equipment (available in faculty workshops)
- Prototype can be tested and validated (physical test)
- Feasible- have good chances for successful completion

5. TEAM

- Consists of up to 5 students.
- Team membership is to be decided by the lecturer.
- Student are not allowed to change group.
- A leader is to be appointed by the team member.
- The lecturer/supervisor reserves the right to add new student or remove any existing member or replace any team leader if it deemed necessary.
- Each group may propose a topic or select the topic offered by the lecturer.
- Students encourage to use Activity Workssheet during their project discussions- link

6. ROLES AND RESPONSIBILITIES

a. TEAM (not limited to the followings)

- Choose a leader
- Hold and attend meetings
- Assigned the tasks evenly
- Complete the tasks on time
- Consult and report the progress to mentor on weekly or bi-weekly basis
- Improve the design as commented by lecturer/mentor
- Attend the assessment activities

b. LECTURERS (Semester 6 only)

- To teach the student on the design theory aspects
- To introduce industry best practices, techniques, and standards
- To assess students understanding and works

c. SUPERVISORS (Semester 6 and 7)

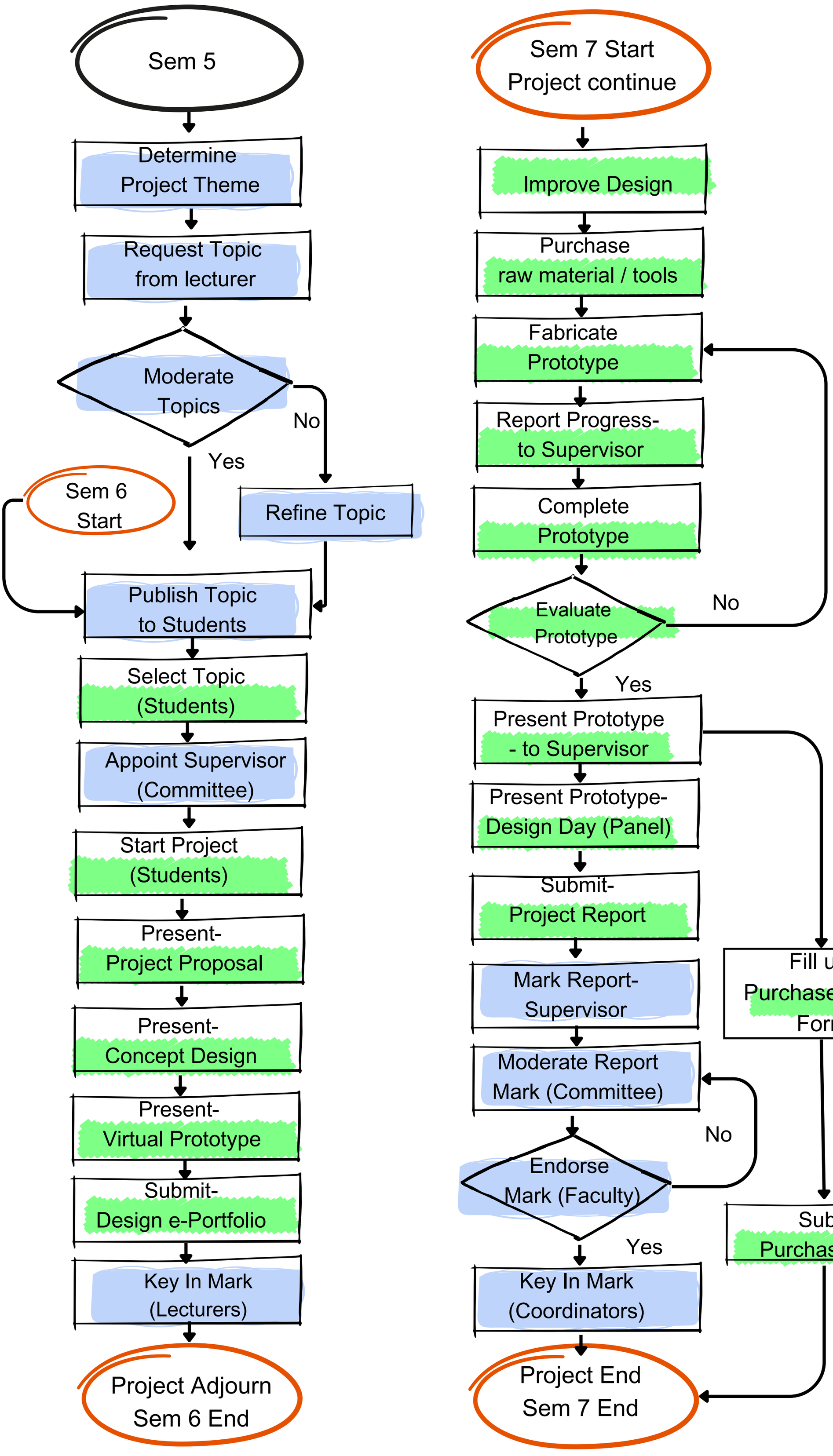
- Guide the team in professional growth and development
- Monitor progress and make adjustments as needed
- Provide constructive feedback
- Encourage independent decision making
- Measure project performance

d. ASSISTANT ENGINEER

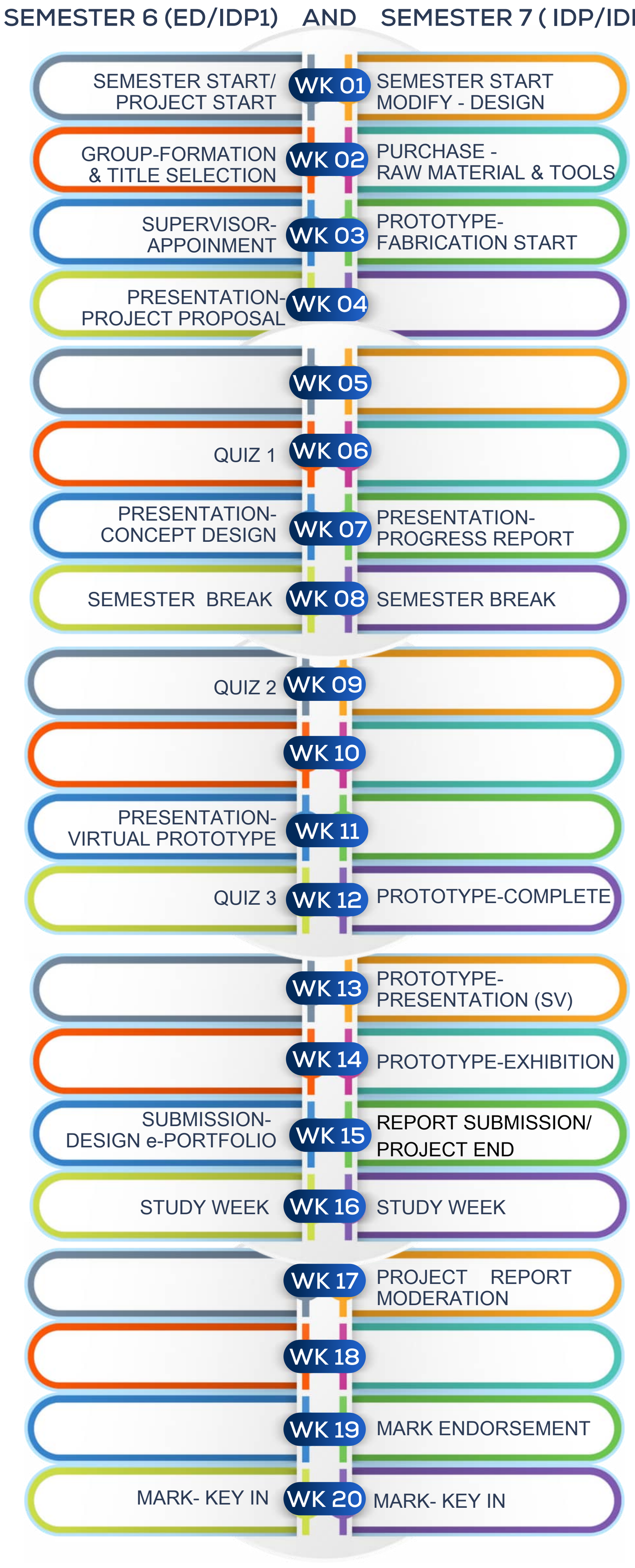
- To help the student on their prototype fabrication works during semester 7.

7. FLOW CHART OF THE PROJECT

ED/IDP1 AND IDP/IDP2



8. TIMELINE OF THE PROJECT



9. ASSESSMENTS

a. Semester 6 (ED/IDP1)

‘i. **Quizzes (3 times)**

- to check students understanding on the topics
- on planning, concept design, embodiment design
- methods-depend on lecturers

ii. **Presentations**

- Planning
  Deliverables; project proposal
  Items (not limited to);
  -market study,
  -benchmark,
  -sustainability study,
  -schedule,
  -cost
- Concept
  Deliverables; individual and final concepts
- Virtual prototype
  Deliverables; Analysis results, final CAD data

Presentation details;

- Power Point or any other presentation software
- 10 minutes duration
- 10 minutes Q&A by lecturer/supervisor/panel

iii. **Design e-Portfolio**

Deliverables; website

- Compilation of creative works during ED/IDP1
- Including engineering drawings

Detail on e**ngineering drawings;**

- Up to date drawing
- Drawing size A3
- Items
- List of drawing,
- BOM drawing,
- assembly drawing
- individual part drawings (excluded standard parts)
- Geometric and Dimensional Tolerances when necessary

iv. **Assessment Rubric Links**

- Quizzes - link not available
- ED1-Proposal Presentation - link
- ED2-Concept Design Presentation - link
- ED3-Virtual Prototype Presentation - link
- ED4-Design e-Portfolio (including engineering drawing) - link

(b) Semester 7 (IDP/IDP2)

i. Progress Report

Deliverables; latest status report

Methods; presentation/interview (depends on supervisor)

Items (not limited to)

- design revision/review
- project planning
- part purchase status
- fabrication status
- other issues

ii. Design/Innovation Day (Prototype Presentation)

Deliverables; complete and functional prototype

Methods: 10 minutes presentation on the project

Items (not limited to)

- functional physical prototype
- live functional performance
- video show if live performance not possible

iii. Project Report

Deliverables;

- soft copy (compulsory) and hard copy (optional-depends on supervisor)

Items (not limited to);

- Compilation of Semester 6 and Semester 7 works

Details

- use provided cover page-link
- compilation of sem 6 and sem 7 works
- written in English
- minimum 30 pages excluding appendix
- font Times New Roman
- letter height 12, one and half spacing
- softcopy (folder links will be given) and hardcopy (depend on supervisor)

iv. Engineering Drawing

Deliverables;

- soft copy of complete and update engineering drawings

Items (not limited to);

- As in Semester 6

v. Project Management

- based on supervisor observation on project implementation during Semester 7
- can be group or individual performance

vi. Peer to Peer Review

- student rate fellow team members on their cooperation and performance
- must be honest
- e-form

vii. Assessment Rubric Links

- IDP1-Progress Report - link
- IDP2- Prototype and Sustainability - link
- IDP3- Project Report - link
- IDP4- Project Management & Finance - link
- IDP5- Peer to Peer Review - link will be given at the end of semester

10. ASSESSMENT AND LO PO MAPPING

a. Semester 6 (ED/IDP1)

No	ASSESSMENT | ASSESSORS	DETAILS OF ASSESSMENT	%	LO	PO	WK	WP	EA
1	Quizzes | Lecturer	i. Quiz 1 ii. Quiz 2 iii. Quiz 3	5 5 5	1	1	4	1,2	-
2	Project Presentation | Lecturer and Supervisor	i. Project Proposal ii. Concept Design iii. Virtual prototype	10 10 10	3 2 2	9 2 2	3 4 -	1, 3	1-5
3	Design e-Portfolio | Lecturer and Supervisor	i. Design Improvement ii. Engineering Drawing iii. Formatting and Grammar	30 20 5	2 2 -	2 3 -	4 4,5 -	3 5 -	-

b. Semester 7 (IDP/IDP2)

No	ASSESSMENT | ASSESSORS	DETAILS OF ASSESSMENT	%	LO	PO	WK	WP	EA
1	Project Progress | Supervisor	Progress Report	5	5	12	6	2	-
2	Product Presentation | Supervisor and Panel	i. Prototype Evaluation ii. Sustainability	40 10	1 1	3 7	4 7	1,2,3 1,2,5	-
2	Technical Report | Supervisor (and Moderator)	i. Project Report a) Introduction and closure b) Concept Design c) Virtual Prototype d) Physical Prototype ii. Engineering Drawing iii. Formatting and Grammar	5 5 5 10 5 5	1 1 2 3 2 5	2 3 5 7 5 12	1,2 5 6 7 6 -	1,2 1,2,3 1,3 1,2 1,7 -	-
3	Group | Supervisor	Project Management and Finance	5	5	12	6	2	-
4	Individual | Student	Peer to Peer Review (PRJ10)	5	4	10	-	-	-

ATTRIBUTES

Complex Engineering Problems

WP1-Depth of knowledge required
WP2-Range of conflicting requirements
WP3-Depth of analysis required
WP5-Extent of applicable codes
WP7-Interdependence

Complex Engineering Knowledge Profile

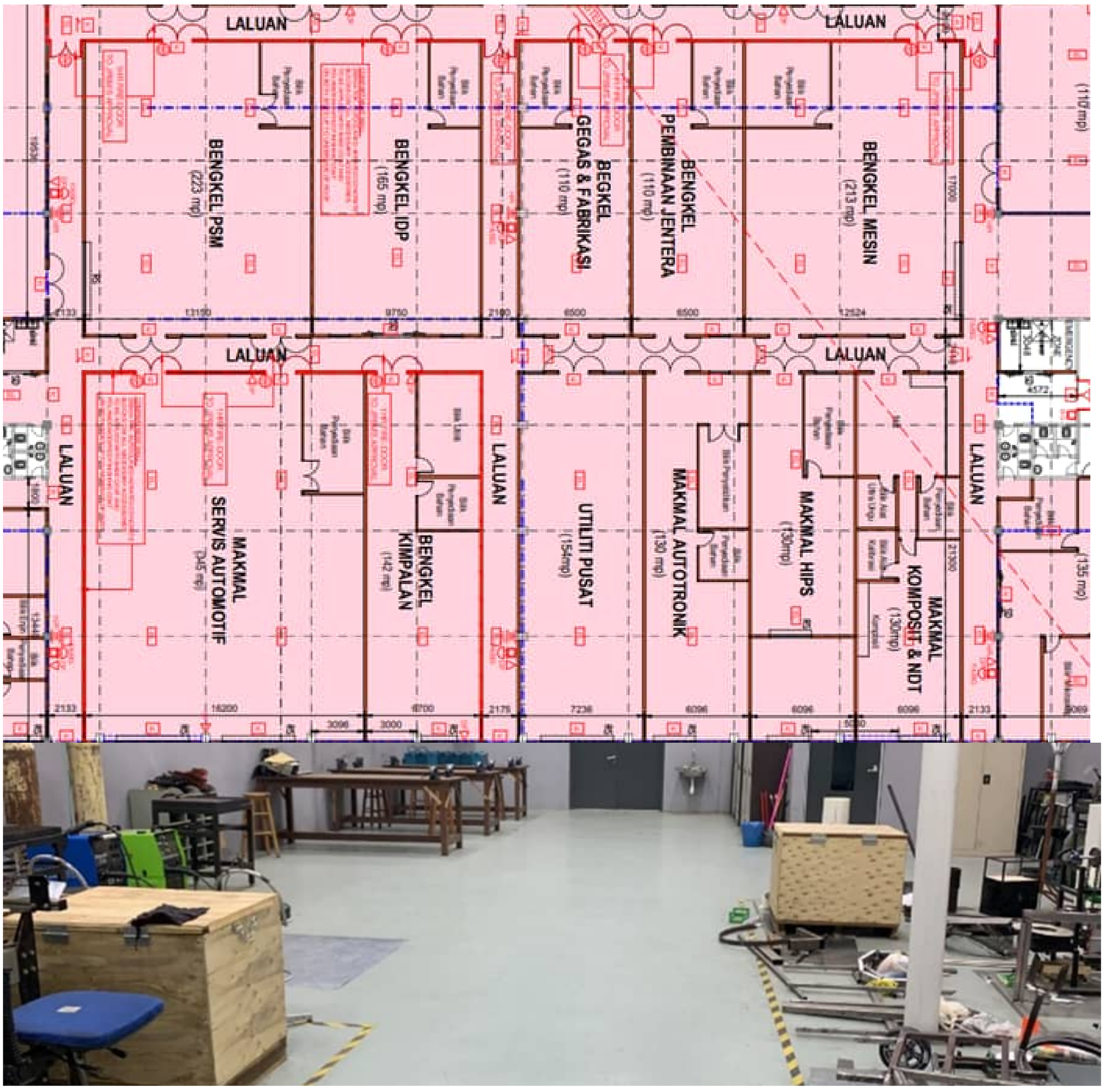
WK1-Natural sciences
WK2-Mathematics
WK3-Engineering fundamentals
WK4-Specialist knowledge
WK5-Engineering Design
WK6-Engineering practice
WK7-Ethics and professional responsibility

Complex Engineering Activities

EA1-Range of resources
EA2-Level of interactions
EA3-Innovation
EA4-Consequences to the society & environment
EA5-Familiarity

11. FABRICATION

- The prototype can be built at IDP workshop and also at the others workshops that are located at Kompleks Makmal Kejuruteraan Mekanikal, Factory 5, FTKM.
- Fabrication slot must be booked through Smart Laboratory System (e-SLABS)- link
- Basic raw material such as metal rods and plates can be taken from the Mechanical Engineering Central Store subjected to the availability.
- Specific raw material must be purchased by students.
- The work in progress prototype can be kept at the IDP workshop with proper tagging (subjected to space availability). However, the faculty bear no responsibility in case of any damage or loss of parts.



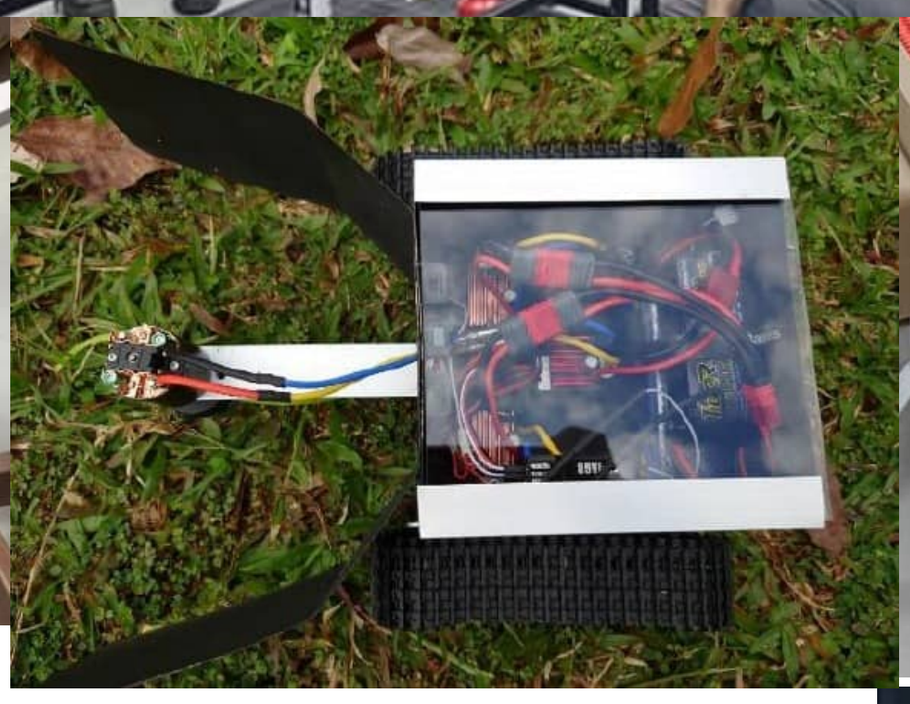
12. PROTOTYPE

- The working prototype can be 1:1 scale or smaller scale depending on the application.
- Faculty reserved the right to keep selected prototypes for Engineering Accreditation Council (EAC) audit references.

13. FUND CLAIM

- The purchase claim can be made at the end of semester 7.
- Claim form link .
- Fill up the purchase claim form
- Attach the relevant original documents such as bills/receipts or other type of payment proofs to the purchase claim form.
- Get the supervisor signature
- Send to FTKM office

14. PREVIOUS PROJECTS



BMCG 3313 ENGINEERING DESIGN
BMCK3013 INTEGRATED DESIGN PROJECT 1

ACTIVITY WORKSHEET

MODULES	ACTIVITY	DELIVERABLES
Product Planning	A1.1; Group Formation-find supervisor	Project Proposal (Presentation)
	A1.2; Problem Definition	
	A1.3; HOQ& Design Specification (PDS)	
Concept Generation	A2.1; Function Study A2.2; Function Diagram	Concept Design (Presentation)
	A2.3; Morphological Chart	
	A2.4; Concept Sketching A2.5; Concept Screening (Absolute Criteria) A2.6; Concept Screening (Relative Criteria) A2.7; Concept Scoring	
Embodiment Design	A3.1; 3D CAD modeling	Virtual Prototype (Presentation)
	A3.2; Structural Analysis	
	A3.3; Risk Assessment (FMEA, Human Factor) and DFMA	
Detail Design	A4.1; Engineering Drawing	Design Portfolio (Writing-website and Presentation)
	A4.2; Costing	

MODULE 1: PRODUCT PLANNING **Work Package 1: Group Formation**						**A1.1**
Section: 1 2 3 4 5 6 7 8 9		**Group: 1 2 3 4 5 6 7**				**DATE:**
Step	**Instruction:** Provide the relevant information into the table below					
1	Identify group name and leader Group Name: Team Leader: Members: 1. 2. 3. 4. 5.					
2	Propose the project Project Name Possibilities P1. P2. P3. P4.					
3	FEASIBILITY CHECK (Y/N)	P1	P2	P3	P4	
	Challenging					
	Involve comprehensive engineering design work					
	Can be fabricated with limited cost, time and equipment					
	Prototype can be tested and validated (mathematical calculation, computer simulation and physical test)					
	Have good chances for successful completion (feasible)					
4	Supervisor Name:					
5	COMMENTS					

MODULE 1: PRODUCT PLANNING **Activity 2: Problem Definition**		**A1.2**
Section: 1 2 3 4 5 6 7 8 9	**Group: 1 2 3 4 5 6 7**	**Date:**
1	Project Title	
2	-What is the problem or issues with current product **Problem/Issues** i. ii. iii. -Any impact on society/environment **Impacts on Society** i. ii. **Impacts on Environment** i. ii. How to improve? i. ii.	
3	Who are your customers? i. ii. ii. iv.	
4	**Customers (**Survey/Interview) **What questions to ask** i. ii. iii. iii.	
	Product (Benchmark) (at least 3) i. ii. iii. iv. What to find out i. ii. ii. iv.	
5	**References** i. ii. iii.	
5	Applicable **standards** for the product	

MODULE 1: PRODUCT PLANNING **Activity 3: Design Specification (PDS)**		**A1.3**
Section: 1 2 3 4 5 6 7 8 9	**Group: 1 2 3 4 5 6 7**	**Date:**
Project Title:		
1	Customer Requirements (CRs) i. ii. iii. iv. v.	
2	Engineering Characteristics (ECs with unit) i. ii. iii. iv. v.	
3	Table of comparison CRs-ECs (with unit) (Complete the table by using the provided table)	
4	House of Quality (HOQ) Complete the HOQ by using the provided attachment	
5	Product Design Specification (PDS) Complete the PDS by referring to the lecture notes	

MODULE 2: CONCEPT GENERATION **Activity 1: Function Study**		**A2.1**
Section: 1 2 3 4 5 6 7 8 9 10	**Group: 1 2 3 4 5 6 7 8 9**	**Date:**
Project Title:		
Instruction: Complete the Function Study Table by referring to lecture notes		

Function	Notes

MODULE 2: CONCEPT GENERATION **Activity 2: Function Diagram**		**A2.2**
Section: 1 2 3 4 5 6 7 8 9	**Group: 1 2 3 4 5 6 7**	**Date:**
Project Title:		
Instruction Create the Function Structure Diagram by referring to lecture notes		

MODULE 2: CONCEPT GENERATION **Activity 3: Morphological Chart**						**A2.3**
Section: 1 2 3 4 5 6 7 8 9		**Group: 1 2 3 4 5 6 7**			**Date:**	
Project Title:						
Instruction: Complete the Morphological Chart by referring to lecture notes						
Functions/Options	Opt 1	Opt 2	Opt 3	Opt 4	Opt 5	Opt 6
Function A ( )						
Function B ( )						
Function C ( )						
Function D ( )						
Function E ( )						
Combination / Concept	**C 1**	**C 2**	**C 3**	**C 4**	**C 5**	**C6**
Combination Ax						
Combination Bx						
Combination Cx						
Combination Dx						
Combination Ex						
Member Assigned						

MODULE 2: CONCEPT GENERATION **Activity 4: Concept Sketching**		**A2.4**
Section: 1 2 3 4 5 6 7 8 9	**Group: 1 2 3 4 5 6 7**	**Date:**
Project Title:		
Instruction Provide rough sketch (es) with relevant label and description		
Concept 1 Member Name:		

Concept 2
Member Name:

Concept 3
Member Name:

Concept 3
Member Name:

Concept 4
Member Name:

Concept 5
Member Name:

MODULE 2: CONCEPT GENERATION **Activity 5: Screening Method (Absolute Criteria)**									**A2.5**
Section: 1 2 3 4 5 6 7 8 9				**Group: 1 2 3 4 5 6 7**					**Date:**
Project Name:									
Activity 1: Absolute Criteria									
Concept	Filter 1			Filter 2			Filter 3		
	Not Feasible	Conditional	Feasible	Yes	Conditional	No	Go	Revise	No Go
Concept 1									
Concept 2									
Concept 3									
Concept4									
Concept 5									
Concept 6									

MODULE 2: CONCEPT GENERATION **Activity 6: Screening Method** **(Relative Criteria)**					**A2.6**	
Section: 1 2 3 4 5 6 7 8 9		**Group: 1 2 3 4 5 6 7**			**Date:**	
Project Name:						
Selection Criteria	Concept 1	Concept 2	Concept 3	Concept 4	Concept 5	Concept 6
Sum of + Sum of – Sum of =						
Net Score						
Rank						
Continue?						

MODULE 2: CONCEPT GENERATION **Activity 7: Scoring Method**												**A2.7**	
Selection Criteria		**Concept 1**		**Concept 2**		**Concept 3**		**Concept 4**		**Concept 5**		**Concept 6**	
	Weight	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score
Total Score													
Rank													
Continue?													

MODULE 3: EMBODIMENT DESIGN **Task 1: 3D CAD MODELING**		**A3.1**
Section: 1 2 3 4 5 6 7 8	**Group: 1 2 3 4 5 6 7**	**Date:**

MODULE 3: EMBODIMENT DESIGN **Activity 2: Engineering Analysis**		**A3.2**
Section: 1 2 3 4 5 6 7 8 9	**Group: 1 2 3 4 5 6 7**	**Date:**
Type of failure	Failure Area	Actions (Calc./ Sim.)
1.		
2.		
Optimization		
1.		
2.		
Others		
1.		
2.		

MODULE 3: EMBODIMENT DESIGN **Activity 3: Risk Assessment During Fabrication, Use and After Use**			**A3.3**
Section: 1 2 3 4 5 6 7 8 9	**Group: 1 2 3 4 5 6 7**		**Date:**
Type of Risk	Area /Seriousness	Tools	Actions
Safety Issue During Fabrication 1. 2.		**FMEA**	
During Use 1. 2.			
After Use 1. 2.			
Ergonomic Issues (size/weight/space/ access/force etc.) During Fabrication 1. 2.		**Anthropometric** **RULA** **REBA**	
During Use 1. 2.			
After Use 1. 2.			
Assembly Issues 1. 2. 3.		**DFMA**	

MODULE 4: DETAIL DESIGN **Activity 1: Engineering Drawing**										**A4.1**		
Section: 1 2 3 4 5 6 7 8					**Group: 1 2 3 4 5 6 7**					**Date:**		
											Time Taken	Total Time

MODULE 4: DETAIL DESIGN **Activity 2: Product Components and Cost**										**A4.1**		
Section: 1 2 3 4 5 6 7 8					**Group: 1 2 3 4 5 6 7**					**Date:**		
Component					**Cost**					**Process**		
No	Main Assembly	Sub Assembly	Part No.	Part Name	Material	Purchase (P) / Fabricate (F)	Quantity	Cost/ Unit	Total Cost	Processes	Time Taken	Total Time

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI TEKNOLOGI DAN KEJURUTERAAN MEKANIKAL

BORANG TUNTUTAN BAYARAN

PROJEK REKABENTUK BERSEPADU / PROJEK REKABENTUK BERSEPADU 2

NAMA PELAJAR : …… NO. MATRIK : ……..

PROGRAM :……. NO. KUMPULAN :……

NO. TELEFON : …… E-MAIL :……

Bil.	Nama Bahan	Kuantiti	No. Resit	Jumlah harga
			JUMLAH:	

Untuk makluman bayaran balik akan dibuat– Maksima RM350.00 setiap projek. Semua tuntutan bayaran hendaklah disertakan dengan resit asal.

TUNTUTAN INI DIBAYAR KEPADA:

NAMA: _____

A/C No: _____.Bank: _____

(Sila sertakan salinan muka depan buku akaun yang mengandungi nama dan nombor akaun)

Pengesahan Penyelia

……..…… ……..……

T/Tangan Pemohon T/Tangan & Cop Penyelia

(NAMA: ……..)

Tarikh : ……..… Tarikh: …….

Nota:

1. Setiap tuntutan perlu menggunakan **BORANG** yang dilampirkan.
2. Tuntutan perlu dibuat oleh **SATU PELAJAR** bagi setiap kumpulan.
3. Setiap kumpulan dibenarkan membuat **SATU KALI** tuntutan sahaja.
4. Sila lampirkan dokumen berikut
    i. Salinan muka depan buku akaun bank (ada nama dan no. akaun bank)
    ii. Bukti pembelian- ditampal pada kertas A4 mengikut turutan pada borang
        a. **Resit tulis tangan** (perlu cop dan tandatangan penjual)
        b. **Resit bercetak** (tak perlu cop dan tandatangan penjual)
        c. **INVOIS** (asal) dan **BUKTI TRANSAKSI BANK** (Penyata Bank)
5. Borang yang telah lengkap perlu diserahkan kepada staf di Pejabat FKM selewat-lewatnya pada hari terakhir perkuliahan setiap semester.

FACULTY OF MECHANICAL TECHNOLOGY AND ENGINEERING

Project Report Cover Sheet
for Submission of Group Work

Course	Code of Course	Submission due date	Group's No. (A MUST)
Project Title			Programme
Supevisor's Name			Received Date (for JK IDP)

This statement should be completed and signed by the student(s) participating in preparation of the report.

Declaration and statement of authorship:

1. We hold a copy of this report, which can be produced if the original is lost/damaged.
2. This project is our original work and no part of it has been copied from any other student's work or from any other source except where due acknowledgment is made.
3. We have not previously submitted or currently submitting this work for any other course/subject.
4. This work may be reproduced and/or communicated for the purpose of detecting plagiarism.
5. We give permission for a copy of our marked work to be retained by the FTKM for review by external examiners.
6. We understand that plagiarism is the presentation of the work, idea or creation of another person as though it is your own. It is a form of cheating and is a very serious academic offence that may lead to expulsion from the University. Plagiarism occurs when the origin of the material used is not appropriately cited.
7. We the undersigned confirm that we have read and agree to abide by the University regulation on plagiarism and cheating policies and procedures.

No.	Student's Name	Matric Number	Student Signature	Date

Assessor's Comments	Marks Breakdown	Assessor's Signature
		Date:

UNIVERSITI TEKNIKAL MALAYSIA MELAKA | FACULTY OF MECHANICAL TECHNOLOGY AND ENGINEERING
BMCG 3313 ENGINEERING DESIGN / BMCK 3013 INTEGRATED DESIGN PROJECT I

NOTE FOR ASSESSORS:
Please fill up the grey colour columns.

ASSESSMENT RUBRIC : PROPOSAL PRESENTATION					No/Rev: ED1/R2	
					Date: 26/10/2020	
PROGRAMME	**SECTION**	**GROUP**	**SESSION**	**SEMESTER**	**DATE**	
Category	**Item**	**Unsatisfactory (0-4)**	**Below Expectation (5-7)**	**Meet Expectations (8-10)**	**Weight**	**Score**
A. CONTENT Introduction	Introduction	Absent, Distracting, or inappropriate	Unappealing, incomplete	Inviting, largely adequate	5	
Design Processes [LO2; PO3; WK5; WP1; WP2; WP3]	Problem Definition	Not identified	Contain errors or biases	Fully describe the design intent	5	
	Business Opportunity	Not identified	Identified but not fully explained	Identified and fully explained	5	
	Literature Review and Benchmarks	Not included or significantly incomplete	Limited search	Through benchmark	5	
	Customers and competitors	Not identified or significantly incomplete	Not fully identified	Fully identified	5	
	Customer Requirements/ Engineering Characteristics	Not included or significantly incomplete	incomplete list, CRs and ECs are not numerically compared	Complete list, CRs and ECs are numerically compared	5	
	Constraints/ relevant standard	Not identified	Identified but not fully explained	Identified and fully explained	5	
	Concept generation	Unclear or too few concepts being considered.	At least three concepts are sketched with appropriate explanation.	More than three concepts clearly sketched and annotated.	10	
Product Design Specification [LO2; PO3; WK5; WP1; WP2; WP3]	Product Design Specification including development cost	Not included or significantly incomplete	Limited technical specs, target vague or unrealistic	Clearly rank ECs, Targets and constraints clearly identified	20	
Project management [LO2; PO3; WK5; WP1; WP2; WP3]	Project Management	Missing milestones or unrealistic expectations	Optimistic expectations, likely will require significant extra time	Key milestones clearly identified; timely completion expected	15	
Conclusion [LO2; PO3; WK5; WP1; WP2; WP3]	Conclusion	Absent or only inferred	Satisfactory; basic summary	Good summary, presents case	10	
B. PRESENTATION MATERIAL	Message Content and Organization	Largely unclear; lacks substance and disorderly	Portions unclear; little substance and minor confusion	Clear; points well supported and easily followed without difficulty	5	
	Visual Aids Quality	Poor; misleading	Good; informative	Superb; insightful	5	
				TOTAL MARKS (A+B /1000)		

Comments

Evaluators Name:

ASSESSMENT RUBRIC PRJ2: CONCEPT DESIGN PRESENTATION [LO2 PO2, WK4 WP3]					Doc. No: ED2 Revision: R0 Date:6/4/2023	
COURSE		**SECTION**	**GROUP**	**SEMESTER/SESSION**	**DATE**	
BMCG	**BMCK**					
Category	Item	Unsatisfactory 0 -4	Below Expectation 5 -	Meet Expectations -10	Weight	Score
A.CONTENT **Introduction**	Introduction	Absent, Distracting or inappropriate	Unappealing, incomplete	Inviting, largely adequate	5	
Concept Generation	i HOQ ii. Function Structure Diagram iii.Morphological Chart	No ability shown to select and apply tool, techniques, skills to solve design problem.	Limited ability shown to correctly select and apply tool, techniques, skills to solve design problem.	Adequate ability shown to correctly select and apply tool, techniques, skills to solve design problem.	15	
Individual Concepts	Brief introduction on individual concepts -quantity, quality and variety	Limited individual concepts of low quality and low variety	Adequate individual concepts with mixed quality and variety	Adequate individual concepts of high quality and high variety	15	
Concept Evaluation	i. Concept Screening ii. Concept Scoring including concept combination and revision	No ability shown to select and apply tool, techniques, skills to solve design problem.	Limited ability shown to correctly select and apply tool, techniques, skills to solve design problem.	Adequate ability shown to correctly select and apply tool, techniques, skills to solve design problem.	10	
Final Concept	Relevance to the need	Vaguely related to overall need,	Moderately related to overall needs	Clearly related to overall needs	10	
	Creativity in ideas	Little or no creativity	Moderate creativity	Impressive creativity	10	
	Feasibility of the concept	Ignores most important issues	Addresses several important issues	Addresses all vital issues	10	
	Quality of the concept explanation	Not included or significantly incomplete	incomplete ; unclear if meet constraints	well developed; shown to meet constraints	10	
Conclusion	Conclusion	Absent or only inferred	Satisfactory; basic summary	Good summary, presents case	5	
B.PRESENTATION MATERIAL	Message Content and Organization	Largely unclear; lacks substance and disorderly	Portions unclear; little substance and minor confusion	Clear; points well supported and easily followed without difficulty	5	
	Visual Aids Quality	Poor; misleading	Good; informative	Superb; insightful	5	
				TOTAL SCORE (/100)		
COMMENTS **EVALUATOR'S NAME:**						

UNIVERSITI TEKNIKAL MALAYSIA MELAKA | FACULTY OF MECHANICAL TECHNOLOGY AND ENGINEERING
BMCG 3313 ENGINEERING DESIGN / BMCK 3013 INTEGRATED DESIGN PROJECT 1

NOTE FOR ASSESSORS:
Please fill up the grey colour columns.

ASSESSMENT RUBRIC PRJ3:VIRTUAL PROTOTYPE PRESENTATION [LO2, PO2; WK4, WP3]					No/Rev: ED3/R0 Date: 6/4/2023	
PROGRAMME	**SECTION**	**GROUP**	**SESSION**	**SEMESTER**	**DATE**	
Items	Explanation	Unsatisfactory 0 -4	Below Expectation 5 -	Meet Expectations -10	Weight	Score
A. CONTENT Introduction	Introduction	Absent, Distracting or inappropriate	Unappealing, incomplete	Inviting, largely adequate	5	
Completeness of virtual prototype	Features and interactions between module	Not included or significantly incomplete	Some relevant features are included but some module interactions are missing	All relevant features are included; multiple interaction detailed	10	
Design Considerations	i. DFMA ii. Human Factor, iii.FMEA	No ability shown to select and apply tool, techniques, skills to solve design problem.	Limited ability shown to identify, analysed and show skill in using tool, and techniques to solve design problem.	Adequate ability shown to identify, analysed and show skill in using tool, and techniques to solve design problem.	15	
Engineering Analysis	Assumptions Calculations Safety Factor	Not included or significantly incomplete	Analysis incomplete or not well correlated to design choices	Sound supporting analysis with clear justification of design choices	15	
Functionality	How the machine work-how EC fulfil CR	Not included or significantly incomplete	Limited functionalities of the prototype are shared	Able to show all functions of the prototype clearly	10	
Components	Part List Quantity Purchase/Fabricate	Not included or significantly incomplete	Components listed but specifics undetermined or unclear	All components/ details are specified	10	
Manufacturing Preparation	Materials/Processes	Not included or significantly incomplete	Limited information on materials and manufacturing process	The material and manufacturing process are described in details	10	
Development Cost	Materials Outsource Processes	Not included or significantly incomplete	Too vague to be useful; too detailed to be correct; missing items; limited discussion on estimated costs	Major expenses identified and researched; sufficient discussion of estimated costs	10	
Conclusion	Conclusion	Absent or only inferred	Satisfactory; basic summary	Good summary, presents case	5	
B. PRESENTATION MATERIAL	Message Content and Organization	Largely unclear; lacks substance and disorderly	Portions unclear; little substance and minor confusion	Clear; points well supported and easily followed without difficulty	5	
	Visual Aid Quality	Poor; misleading	Good; informative	Superb; insightful	5	
				TOTAL SCORE (/1000)		

COMMENTS

EVALUATOR'S NAME:

NOTE FOR ASSESSORS:
Please fill up the grey colour columns.

ASSESSMENT RUBRIC : DESIGN PORTFOLIO					No./Rev:ED4/R2	
					Date: 13/06/2023	
PROGRAMME	**SECTION**	**GROUP**	**SESSION**	**SEMESTER**	**DATE**	
Category	**Item**	**Unsatisfactory (0-4)**	**Below Expectation (5-7)**	**Meet Expectations (8-10)**	**Wt**	**Score**
(A) PRJ4-DESIGN IMPROVEMENTS (30%) [LO2; PO2; WK4;WP1;WP2;WP3]						
PRODUCT PLANNING	Introduction	Not included or significantly incomplete	The item described are not fully updated based on previous comments	The item described are well-updated based on previous comments	1	
	Problem statement				1	
	• Literature review and benchmarks • Customers and competitors • Business opportunity				1	
	• Customer requirements/ Engineering characteristics				1	
	• Constraints / relevant standard				1	
	• Product Design Specification (PDS)				1	
CONCEPT DESIGN	• Function structure • Morphological chart • Individual concept • Concept selection • Final design (Concept) description	Not included or significantly incomplete	The concept designs are not fully updated based on previous comments	The concept designs are well-updated based on previous comments	2	
VIRTUAL PROTOTYPE (CAD DATA)	FEA	Not included or significantly incomplete	The virtual prototype are not fully updated based on previous comments	The virtual prototype are well-updated based on previous comments	4	
	DFMA				2	
	FMEA				2	
	Human factor				2	
	Functionality Animation/ Explanation				3	
PHYSICAL PROTOTYPE PLANNING	Material	Not included or significantly incomplete	The item described are not fully updated based on previous comments	The item described are well-updated based on previous comments	3	
	Fabrication				3	
	Costing				3	
					SCORE	
(B) PRJ5-ENGINEERING DRAWING] (20%) [LO2; PO3; WK4;WK5;WP1;WP2;WP3						
DRAWING	**COMPLETENESS** Assembly (sub assembly) drawings BOM drawing Individual drawings	Not included or significantly incomplete	The concept described are not fully updated based on previous comments	The concept described are well-updated based on previous comments	10	

	QUALITY Title blocks info Dimensions (quantity and decimal points) Symbols (GDnT, welding etc) Projection views/scale				10	
					SCORE	
(C) PRJ6-PROFESSIONALITY (5%) **[LO3; PO9;WK3;WP1]**						
STRUCTURE		Presentation are poorly organized; use of sections is illogical and hinders document navigation	Presentation are usually well organized; use of sections are logical and generally allows easy navigation of the document	Presentation are well-organized; use of sections is logical and allows easy navigation through the document	2	
GRAPHICS, FIGURES, TABLES, AND EQUATIONS		Graphical documents, figures, tables, and equations are not clearly or logically identified and fail to support the text	Some graphical documents, figures, tables, and equations are clearly and logically identified and adequately support the text	All graphical documents, figures, tables, and equations are clearly and logically identified and strongly support the text	3	
					SCORE	

COMMENTS :

EVALUATOR'S NAME:

UNIVERSITI TEKNIKAL MALAYSIA MELAKA | FACULTY OF MECHANICAL TECHNOLOGY AND ENGINEERING
BMCU 3013 INTEGRATED DESIGN PROJECT/ BMCK 3023 INTEGRATED DESIGN PROJECT 2

NOTE FOR ASSESSORS:
Please fill up the column in grey colour.

ASSESSMENT RUBRIC : PROGRESS REPORT PRESENTATION (PRJ-1) LO5, PO12, WK6, WP2					No./Rev.: IDP1/R0 Date: 05/10/2023	
PROGRAMME	**SECTION**	**GROUP**	**SEMESTER**	**SESSION**	**DATE**	
Category	**Item**	**Unsatisfactory (0-4)**	**Below Expectation (5-7)**	**Meet Expectations (8-10)**	**Weight**	**Score**
Project Implementation	Based on prior agreed planning / schedule with supervisor	No evidence that project plan was implemented	Evidence that some aspects of project plan implemented with varying effectiveness	Evidence that most aspect of the project plan were effectively implemented	1	
Task Distribution	Task distribution and efforts to complete the task	Students works alone, argues without resolution, unwilling to cooperate	Unequal contributions, overreliance on others, needs reminding	Contributes equally, cooperates, works toward group goals, self-motivated	1	
Tasks Completion	Include; • design revision • part purchase • fabrication	None of the tasks were completed.	Half of the planned tasks were completed with varying quality	All the planned tasks were perfectly completed.	1	
Timeline	Time spent to complete the task	Tasks are delayed without valid reasons	Some tasks are delayed with reasonable excuses	All tasks are carried out as planned	1	
Problem Solving Skills	Ability to; • assess the problem, • finding solution and • implement	Evidence that the group are not capable of finding the solution for the problem faced	Evidence that the group are capable of finding the solution but incapable of implementing it	Evidence that the group are capable of finding the solution and effectively implemented the solution to solve the problem faced	1	
				TOTAL SCORE		

Comments:

Evaluators Name:

UNIVERSITI TEKNIKAL MALAYSIA MELAKA | FACULTY OF MECHANICAL TECHNOLOGY AND ENGINEERING
BMCU 3013 INTEGRATED DESIGN PROJECT / BMCK 3023 INTEGRATED DESIGN PROJECT 2

NOTE FOR ASSESSORS:
Please fill up the grey colour columns.

ASSESSMENT RUBRIC: PROTOTYPE EVALUATION (PRJ-2) LO1, PO3, WK4, WP1, WP2, WP3					No,/Rev.: IDP2/R0 Date: 29/9/2022	
PROGRAMME	**SECTION**	**GROUP**	**SESSION**	**SEMESTER**	**DATE**	
Category	**Items**	**Unsatisfactory (0-4)**	**Below Expectation (5-7)**	**Meet Expectations (8-10)**	**Weight**	**Score**
A. PROJECT AND DESIGN DESCRIPTION (10M)	General description of project (including objective/scope/ CR/EC/PDS)	Absent, distracting, or inappropriate	Unappealing, incomplete	Inviting, largely adequate	3	
	Description of prototype (including subsystems)	Not included or significantly incomplete	Form/function not well understood Major component /subsystem omitted from presentation	Concise summary of form/function All modules/ subsystem introduced; interaction sufficiently introduced	3	
	Description of manufacturing processes (including part/processes/ material/ assembly /joints)	Not included or significantly incomplete	Fabrication/decision making process unclear or not well considered	Concise summary of fabrication including resources, material, and processes	4	
B. QUALITY OF PROTOTYPE (15M)	Completeness; Breadth and depth	Multiple features still do not exist in the prototype	Meet the minimum requirement for depth of features	The feature set is complete	4	
	Simplicity, Reliability, Serviceability, Practicality	Design is complex, consist of unnecessary sophistication and complexity	Design is moderate, consist of minimum unnecessary sophistication and complexity	Design is simple, avoiding any unnecessary sophistication and complexity	4	
	Creativity, Originality, Innovation, Novelty	The pieces show a little or no evidence of original thought	The work lacked sincere originality	Prototype shows a unique level of creativity	4	
	Aesthetics, Workmanship, Craftsmanship and Technical excellence	No attempt was made to address the appearance of the digital/physical prototype.	Meet minimum aesthetical design	Digital/Physical prototype appears to be professionally constructed. It includes colours, logos, or other visual additions which enhance its appearance.	3	
C. PERFORMANCE (15M)	Demonstration of operation (Animation /Physical demonstration)	Not included or significantly incomplete	Prototype demonstration and operation details unclear	Objective described, operational detailed summarised	3	
	Interaction usability	Challenging to use. A detail instruction is required.	Not easy and required some learning time on how to use it.	Intuitive, easy to learn, and easy to use	3	
	Functionality (ability to solve intended problem)	Not included or significantly incomplete	Meet some technical and customer requirements	Meet technical and customer requirements	3	
	Feasibility, Marketability, Application	The prototype is not feasible for the market	Feasible for the market with some modification	Feasible for the market without any modification	3	
	Visual aids quality	Poor; misleading	Good; informative	Superb; insightful	3	
				TOTAL SCORE		

ASSESSMENT RUBRIC: SUSTAINABILITY (PRJ-3) LO3, PO7, WK7, WP1, WP2, WP5					Document No: IDP2/R0 Date: 29/9/2022	
Category	**Items**	**Unsatisfactory (0-4)**	**Below Expectation (5-7)**	**Meet Expectations (8-10)**	**Weight**	**Score**
D. ENVIRONMENT AND SUSTAINABILITY (10M)	Impacts of the designed product. Safety and health concerns	No understanding or appreciation of safety and health related issues.	Serious deficiencies in addressing health and safety issues leading to a unsupported and/or infeasible result.	Complete understanding of health and safety issues leading to sound and supported results.	5	
	Environmental and sustainability concerns	No consideration of environmental and sustainability aspects.	Serious deficiencies in understanding and application of environmental and sustainability aspects.	Complete understanding of environmental and sustainability aspects.	5	
					TOTAL SCORE	

COMMENTS:

EVALUATOR'S NAME: _____

UNIVERSITI TEKNIKAL MALAYSIA MELAKA | FACULTY OF MECHANICAL TECHNOLOGY AND ENGINEERING
BMCU 3013 INTEGRATED DESIGN PROJECT /BMCK 3023 INTEGRATED DESIGN PROJECT 2

NOTE FOR ASSESSORS:

Please fill up the grey colour columns.

ASSESSMENT RUBRIC: PROJECT REPORT					No./Rev.: IDP3/R0 Date: 26/6/2023	
PROGRAMME	**SECTION**	**GROUP**	**SEMESTER**	**SESSION**	**DATE**	
Category/Topic	Items	Unsatisfactory (0-4)	Below Expectation (5-7)	Meet Expectation (8-10)	Weight	Score
A.TECHNICAL REPORT (30%)						
INTRODUCTION (PRJ-4) LO1 PO2 WK1, WK2, WP1, WP2	***INTRODUCTION*** *Objectives* *problem statements*	Not included or significantly incomplete	Assumed too much familiarity with project; audience confused	Sufficient to bring audience up to speed and provide context	1	
	BACKGROUND STUDY *Literature review. benchmarks*	Not included or insufficient literature reviews and benchmarks	Limited evidence of literature reviews and benchmarks	Adequate evidence of literature reviews and benchmarks	1	
	DESIGN REQUIREMENTS *CR/relate to background study*	Not included or insufficient writing on design requirement	Limited writing on design requirement	Adequate writing on design requirement	1	
CONCEPT DESIGN (PRJ-5) LO1 PO3 WK5, WP1, WP2, WP3	***DESCRIPTION*** *Brief description on individual concepts*	Not included or lack of description on concept design	Limited description on concept design	Complete description of the concept design	3	
	FINAL CONCEPT *Explain about the final product Including mechanism, sub-mechanism if any*	Lack information about final product	Limited information about final product	Complete information about final product	4	
	EMBODIEMENT OF DESIGN *Include element of* • *Initial analysis* • *DFMA,* • *DFMEA and* • *Human factor*	Not included or lack of description	Limited description	Complete description	3	
VIRTUAL PROTOTYPE (PRJ-6) LO2 PO5, WK6, WP1,WP3	***FINITE ELEMENT ANALYSIS*** *Mechanism testing (measurable if possible)*	Not included or lack of report on testing	Limited testing and insufficient report	Adequate testing and well reported	5	

PHYSICAL PROTOTYPE (PRJ-7) LO3 PO7 WK7, WP1, WP2	***FABRICATION*** *Standard parts(purchase)/fabrication* *Material/process selection* *Process Selection/sequence* *Tools/component/machines used* *Finishing (surface finish/paint etc)* *Sub and Main Assemblies Description*	Not included or lack of description on prototype fabrication processes	Limited and not well described fabrication processes	Complete, well described and well justified fabrication processes	5	
	TESTING *Testing Procedure (Items)-photo/proof* *Test Result* *Output (final-improvements after test)* *PDS/CR fulfilment (measurable)* *Discussion*	Not included or lack of description on testing	Limited and not well described testing	Complete, well described and well justified testing	3	
	COST *manufacturing cost-including material/service (vendor)*	Not included or lack of description on costing	Limited and not well described costing	Complete, well described and well justified costing	2	
CLOSURE (PRJ-4) LO1 PO3 WK1, WK2 WP1, WP2	***CONCLUSION*** *Summary of the report*	Very weak, unclear and incorrect	Strong and clearly stated	very strong and very clearly stated	1	
	SUGGESTION and IMPROVEMENT *Discussion on limitation (material/methods/test/skills/funds etc)*	Not included or lack of understanding/maturity/ reflection in judging whole design processes	Limited understanding/maturity/ reflection in judging whole design processes	Good understanding/maturity/ reflection in judging whole design processes	1	
	-END OF TECHNICAL REPORT CONTENT-					
B. ENGINEERING DRAWING (5%)						
ENGINEERING DRAWING (PRJ-8) LO2, PO5, WK6, WP1, WP3	*Adequate drawings* *Including Schematic Diagram-pneumatic/hydraulic/ circuit diagram* *Adequate dimension with Relevant Symbol (incl. welding, GD&T and others)*	Not included or insufficient information	Incomplete information	Sufficient information	5	
	-END OF ENGINEERING DRAWING CONTENT-					
C. FORMATTING AND GRAMMAR (5%)						
FORMATTING AND GRAMMAR (PRJ-9) LO5, PO12	Structure	Paragraphs are poorly organized; use of sections is illogical and hinders document navigation	Paragraphs are usually well organized, use of sections are logical and generally allows easy navigation of the document	All paragraphs are well-organized; use of sections is logical and allows easy navigation through the document	1	
	Graphics, Figures, Tables, and Equations	Graphical documents, Figures, tables and equations are not clearly or logically identified and fail to support the text	Some graphical documents, figures, tables and equations are clearly and logically identified and adequately support the text	All graphical documents, figures, tables and equations are clearly and logically identified and strongly support the text	1	
	Formatting	Document is formatted poorly and lacks a quality cover page and index	Formatting of the document is generally consistent and adequate, and includes a good quality cover page and index	Formatting of the document is professional and includes a professional cover page and index	1	
	Mechanics	Sentences are poorly written; there are numerous incorrect word choices and errors in grammar, punctuation and spelling	Sentences are generally well-written; there are a few incorrect word choices and errors in grammar, punctuation and spelling	Sentences are well-written; there are no incorrect word choices and the text are free of errors in grammar, punctuation and spelling	1	
	Documentation and References	Fails to correctly document any sources or to utilize appropriate citation forms	Most sources are correctly documented; appropriate citation forms are generally utilized	All sources are correctly and thoroughly documented; appropriate citation forms are utilized throughout	1	
	-END OF FORMATTING AND GRAMMAR-					

COMMENTS

EVALUATOR NAME'S:……

NOTE FOR ASSESSORS:
Please fill up the grey colour columns.

ASSESSMENT RUBRIC: PROJECT MANAGEMENT AND FINANCE (PRJ-10) LO5, PO12, WK6, WP2					No./Rev.: IDP4/R0 Date: 26/06/2023	
PROGRAMME	**SECTION**	**GROUP**	**SEMESTER**	**SESSION**	**DATE**	
Project Phase	**Items**	**Unsatisfactory** (0-4)	**Below Expectation** (5-7)	**Meet Expectation** (8-10)	**Weight**	**Score**
A. Execution of the Project	Coordination and Consultation	Sometimes worked effectively as a team and seldom consult or update supervisor on the project progress	Worked effectively as a team most of the time and sometimes consult or update supervisor on the project progress	Worked effectively as a team at all times always consult or update supervisor on the project progress	3	
B. Monitoring and Controlling the Project	Problem Analysis and Reporting	Provided incomplete report of most problems encountered during project execution but did not correct them	Provided relatively accurate, complete reports and corrected most problems encountered during project execution	Provided accurate, complete reports of project progress and corrected most problems encountered during project execution	3	
C. Closing the Project	Time, scope and quality of the report and prototype	Turned in all project deliverables late. The deliverables are out of the agreed scope and low in quality	Turned in most project deliverables late. The deliverables are within the agreed scope and moderate in quality	Turned in most project deliverables on or before the due date. The deliverables are within the agreed scope and high in quality	2	
D. Financial Analysis	Budget management in relation to quality and delivery time	Lack of financial analysis. The project cost is more than allocated budget. No efforts were made to compromise the budget, quality and delivery time.	Limited financial analysis. The project cost is more than the allocated budget. Insufficient design parameters were modified to compromise between the budget, quality and delivery time	Sufficient financial analysis shown to control the budget. The project cost are within budget constraints. Adequate design parameters were modified to compromise between the budget, quality and delivery time	2	
					TOTAL SCORE	

COMMENTS

EVALUATOR NAME'S: ……