FMTH0301/Rev.5.3

Course Plan

Semester: **6 - Semester**	Year: 2018-19
Course Title: **Minor Project**	Course Code: 18EMEW301
Total Contact hrs: 03	Duration of ESA:
ISA Marks: 50	ESA Marks: 50
Lesson Plan Author: U P Hosmani, Gireesha C, Gururaj F, Sridhar M	Date: 24 – 12 – 2018
Checked By: Dr. B B Kottureshettar	Date: 26 – 12 – 2018

Course: Minor Project

Course code: 18EMEW301

Semester: Six

Credits: 6

Team size: Six in a team

Team criteria: Team members can be from different divisions, Minimum of one diploma student in a team and selection of one student from other branches is optional.

Theme: Precision Agriculture, Hospital Automation, Factory Automation, Social Issues or Any other Mechatronic Product.

Course Outcomes:

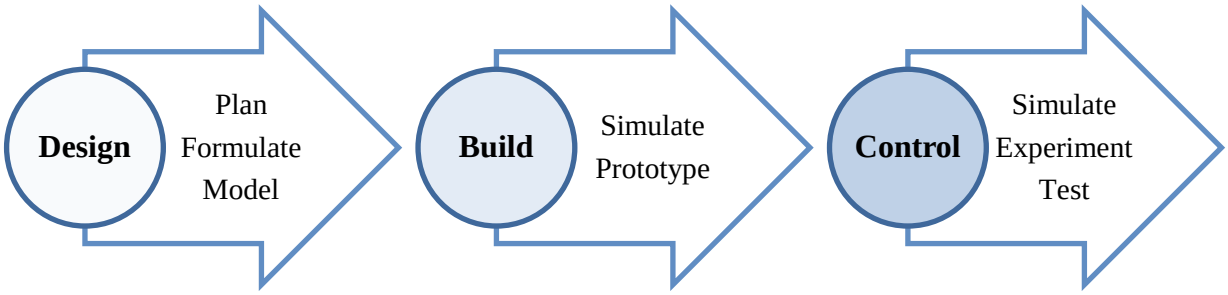
1. Use design thinking to foster empathy for the context of a problem, creativity in the generation of insights and solutions, and the skill to materialize those solutions.
2. Design solutions combining integration of disciplinary knowledge, critical thinking and innovation.
3. Build prototype iteratively to convey the chosen solution idea.
4. Realize the final solution through control of electro-mechanical interface.
5. Validate the outcome on seeking feedback from users and industry experts.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Title **Minor Project**														Semester: 6
Course Code: 18EMEW301														Year: 2018-19
Course Outcomes (COs) / Program Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
1. Use design thinking to foster empathy for the context of a problem, creativity in the generation of insights and solutions, and the skill to materialize those solutions.			H					L						
2. Design solutions combining integration of disciplinary knowledge, critical thinking and innovation.			H											
3. Build prototype iteratively to convey the chosen solution idea.			H						M	L	L			
4. Realize the final solution through control of electro-mechanical interface.				M										M
5. Validate the outcome on seeking feedback from users and industry experts.			M							L				

Degree of compliance **L**: Low **M**: Medium **H**: High

Methodology to be followed for carrying out the projects:



Assessment: Students shall be assessed as a team and individual across various stages of the project using appropriate assessment tool and criteria.

Mentoring: Each student team shall be allotted with a FPG (Facilitator Philosopher Guide) team which consists of faculty experts from Product Design, Manufacturing, Mechatronics and Computer Aided Engineering domains.

Role of FPG Team: FPG teams shall be actively be involved in continuous interaction of students. Roles can be understood as follows:

Facilitator: Facilitate entire project activities and their logistics,

Philosopher: Counsel the students as teams and individual to motivate them to perform better at each stage of the project. Involved in continuous interaction to make sure timely completion of the activities.

Guide: Provide technical support across all the stages and assess the student's performance.

FPG Team:

Mentors group 1 FPG 1	**Mentors group 2 FPG 2**	**Mentors group 3 FPG 3**	**Mentors group 4 FPG 4**
Team 1-12	Team 14-27	Team 13,16,17, 29-38	Team 39-50
Gururaj Fattepur G-(1-3)	U P Hosmani G- (14, 15, 18)	Sridhar M G- (29-31)	Gireesha R Chalageri G- (39-41)
Mantesh C G- (4-6)	G M Hiremath G- (19-21)	Arun Patil G- (13, 16, 17, 28, 37)	Shivaprasad M G- (42-44)
Anand Raj G- (7-9)	Nagaraj Ekbote G- (22-24)	Satish J G- (32-34)	Shreeshail M L G- (48-50)
Santosh Billur G- (10-12)	Rajashekar Savadi G- (25-27)	Madhusudan H K G- (35, 36, 38)	Srihari Katti G- (45-47)

**G-() stands for guides for team numbers*

Evaluation of Minor-Project

The evaluation of project work shall be done in two stages as Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) having equal weightages in marks.

CIE Evaluation:

- The CIE evaluation of project work shall be done in stages by the domain experts FPG review panel including guide. In addition the guide shall separately evaluate the progress of project till its completion.
- There shall be three reviews by the panel experts and marks shall be allotted as per the weights given for each review. The student shall showcase the progress of work through the presentation, videos, models, prototypes, etc to the panel members during the reviews.
- Each of the micro activities involved in accomplishing a project have been identified and included in the evaluation criteria as performance indicators. These performance indicators are being made known to students from day one of the project which helps them to plan and be guided to reach the intended goal. The assessment of each of the performance indicators is carried out as per rubrics which are also shared with the students.
- The review panel will be given a detailed assessment rubrics for each review based on which the panel experts will award the marks.
- Project guide shall be having individual responsibility to assess the entire project work and award the marks as per the assessment rubrics.
- During each review the panel experts shall advice the students with various aspects of the work for continuous development and Implementation.

SEE Evaluation:

- Student shall prepare a detailed project report according to approved guidelines and duly signed by the guide(s) and the Head of the Department and submit it to the examiners.
- The SEE evaluation of the project work shall be based on the demonstration of the model/prototype, presentation, project report submitted and a Viva-Voce by a team consisting of the Guide, an Internal examiner (other than the guide) and an External Examiner appointed by the department.
- Student shall submit a copy of the approved project report after the successful completion of viva examinations to the department.

Evaluation Scheme

CIE Scheme

Assessment	Weightage in Marks
Review I	20
Review II	20
Review III	10
Total	**50**

SEE Scheme

Assessment	Weightage in Marks
Semester End Examination	50

Assessment Rubric-Design Phase
(Sample for PO 3)

Team No.:																		
Individual Assessment (Student +Mentor)																		
Marks▶		**1-3**						**4-7**						**8-10**				
Rubric▼	Student▶	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**
a. Refined problem statement																			
b. Product benchmarking																			
c. Design Specifications																			
d. Concept generation																			
e Design																			

Group Assessment- Design (Mentor Only)				
Rubric▼	Student▶	1-3	4-7	8-10
a. Refined problem statement				
b. Product benchmarking				
c. Design Specifications				
d. Concept generation				
e Design				
a. Refined problem statement				
Total Marks :				

Si	**Roll #**	**URN**	**Student Name**	**Marks (Mentor)**
#1				
#2				
#3				
#4				
#5				
#6				

** Self assessment shall be done by individual student by BLUE ink and shall be submitted to respective mentors. Mentors shall assess the student individual and group in RED ink pen. *Students shall fill their names, URN and roll numbers in the block.*

Phase wise expectations and tasks:

Design Phase:

1. Refined problem statement		*(Tick mark the cell once each activity is completed)*
1.1	Identifying end users (Customers)	
1.2	Identify customer needs	
1.3	Analyzing the needs	
1.4	Requirements List	
2. Product benchmarking		
2.1	Studying and exploring competitive products	
2.2	Patent search	
2.3	Literature survey	
3. Design Specifications		
3.1	Objectives	
3.2	Constraints	
3.3	Objective tree (affinity diagram)	
3.4	Design Specifications	
4. Concept generation		
4.1	Defining Functions	
4.2	Morphological chart	
4.3	Generating design alternatives	
4.4	Selecting best alternatives (Pugh chart)	
5. Design		
5.1	3D Model	
5.2	Assembly models	
5.3	2D drawing	
5.4	Design Calculations	
6 Prototype Planning		
6.1	Raw materials	
6.2	Bill of Materials	
6.3	Joining techniques/ methods	
6.4	Flow Chart	
6.5	Sub-Assembly Planning	

Phase 1

1 **Refined problem statement**

1.1 Identifying end users (Customers)

- Determine who the customers are for your product

1.2 Identify customer needs

- Determine what information should be gathered from customers, their needs, expectations

1.3Analyzing the needs

- Determine how that information should be gathered
  - Interviews (consult your end users and have a one to one interaction based on few structured questions- record the conversations)
  - "On the job" observations (Visit the user's workplace and observe the traditional way in which the jobs are performed)
  - Surveys (Form a questionnaire and collect customers feedback with their sign- approximately 30 in hard copies)
  - Focus groups (Brainstorm with the domain experts and document your conversations)

Customer:	Interviewer(s):	Date:
Question/Prompt	**Customer Statement**	**Interpreted Need/ Expectations**
Typical uses *(list the users)*		
Likes-current methods followed(traditional techniques)		
Dislikes-current methods followed(traditional techniques)		

Suggested Improvements		

1.4 Requirements List

Customer	**Requirements** *(write the customer expectations in engineering terms)*

Phase 2

2. Product Benchmarking

2.1 Studying and exploring competitive products

(Visit local market or surf internet to identify at least five competitive products which already exist in market having similar functions. You may consider few products that partially fulfill the customer requirements. Explore their specifications, costs, limitations, availability, etc..)

Products (Images or name)	**Specifications**	**Cost**	**Advantage**	**Limitations**	**Functions**
1					
2					
3					
4					
5					

2.2 Patent search

(Gather few patents that may help you to understand the functions/ engineering principles/ techniques/ technology existence or any other relevant information for your product)

Patent Name/ Number/ Date	Information

2.3 Literature survey

(Refers to collection and referring to few research papers/ journal articles/ press release news documents/ product catalogues/product exhibitions/ or any other relevant resources)

Literature details	Gathered Information

Phase 3

3. Design Specifications

3.1 Objectives

(List the objectives for your product, you may consider reading this document from page 7 https://www.eecs.yorku.ca/course_archive/2002-03/F/ENG1000/ENG1000_needs_v2.pdf)

Objectives	

3.2 Constraints

(List the constraints for your product, you may consider reading this document from page 7 https://www.eecs.yorku.ca/course_archive/2002-03/F/ENG1000/ENG1000_needs_v2.pdf)

Constraints	

3.3 Objective tree (affinity diagram)

(List the constraints for your product, you may consider reading this document from page 19-27 https://www.eecs.yorku.ca/course_archive/2002-03/F/ENG1000/ENG1000_needs_v2.pdf)

O#	Objectives	First level objectives	Second level objectives	Third level objectives
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				

Objective tree:

3.4 Design Specifications:

(With reference to the identified customer needs, competitive products objectives, and constrains; write the design specifications that your product should specify. You may consider reading this article http://homepages.cae.wisc.edu/~me349/lecture_notes/product_design_spec.pdf . Each specifications should compulsorily have a measuring units.)

Si.	Engineering Specifications	Units

Competitive Benchmarking:

Metric #	Metric	Units	Competitive Products		
			Product 1 (name)	Product 2 (name)	Product 3 (name)
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

(You may refer to following information; remember your activity in engineering design sessions!!)

Identify metrics that actually measure the requirements, the design is supposed to meet. Having decided what to measure, determine the appropriate units in which to make the measurement. Need to develop metrics for *all the demands*.

Relationship of new product to competitive products is critical to success in the marketplace. A product is differentiated from its competitors by being better on high priority needs. This process is called "Competitive Benchmarking". It creates understanding of relative position in marketplace. It also validates the product design specifications.

Table: Competitive Benchmarking:

R Nos	Metric	Units	Competitive Products		
			Edlund Can Crusher (A)	Can Ram (B)	Aluminium Bars (C)
9	Number of sharp edges	Nos.	NA	NA	NA
16	Number of Cans Crushed	Nos.	Upto 10/min	10 cans in 10 sec	12 / min
17	Storage Capacity	Nos.	≤ 10	≤ 10	12
10	Noise Level during operation	dB	68	71	66
20	Maximum Weight	kg	77.1	85.1	82.7
11	Height of can loading	in	27	25	22
21	Number of components / sub-assemblies	Nos.	-	-	-
6	Failure rate to reject other cans	%	-	-	-
4	Dimensions (Volume)	m^3	0.43	0.21	0.33

The final step is to list the design specifications. The specifications should include the metrics, units, ideal value and marginal value. To validate these specifications, appropriate test methods have to be identified / generated.

Phase 4

4.1 Concept Generation

4.1 Defining Functions

(Define the functions that your product is intended to do:
You may follow any of the engineering techniques.
Suggested reading:

a. https://www.eecs.yorku.ca/course_archive/2002-03/F/ENG1000/ENG1000_needs_v2.pdf Page 7
b. http://personal.stevens.edu/~bmcnair/ECE-D6-S17/ECE322-5.pdf

c. https://www.egr.msu.edu/classes/ece480/capstone/fall08/group02/Six%20Sigma/SixSigma4.pdf)

Si.	Functions	Sub Functions (optional)

4.2 Morphological Chart

Construct the morph chart for identified functions(max 5)

Suggested reading

a. http://personal.stevens.edu/~bmcnair/ECE-D6-S15/ECE322-6.pdf Slide 4-9
b. http://www.staff.city.ac.uk/~ra600/ME1105/HANDOUTS/ME1110-12-H.pdf slide 9 and 10
c. Dym and Clive Book https://drive.google.com/file/d/1pElkjlWpe7zoPmt69SsGenDkPfYK7ef-/view?usp=sharing Page 101-107

Functions ▼	Means►	**Means 1**	**Means 2**	**Means 3**	**Means 4**	**Means 5**
Function 1		*You may insert text or images here*				
Function 2						
Function 3						
Function 4						
Function 5						

4.3 Generating design alternatives

Identified Design Alternatives:

Si.	Design Alternatives
1	
2	
3	
4	

Sketch of generated design concepts/ alternatives:

(Draw rough free hand sketches to indicate the design alternatives)

Design Alternative 1

Design Alternative 2

Design Alternative 3

Design Alternative 4

4.4 Selecting Design Alternative

(Refer https://docs.google.com/presentation/d/1YrGB4lhCuyW8QNdHVhXObJTF2-LNY83jiAoh_SwyfsU/edit?usp=sharing Slide 7-11))

Requirements	Weight	Design1	Design2	Design3	Design4	Design5	Reference
Pluses							
Sames							
Minuses							
Overall Total							
Weighted Total							
Yes / No							

Selected Design Alternative:_____

5.1 3D Model

Part Model 1
Part Model 2
Part Model 3
Part Model 4
Part Model 5
Part Model 6

5.2 Assembly models

Assembly Model

5.3 2D Drawings

2D Drawing 1
2D Drawing 2
2D Drawing 3
2D Drawing 4
2D Drawing 5

2D Drawing 6

5.4 Design Calculations

Design Calculations
You may scan and paste your design calculations here(clear image) or you may opt to type the calculations here as well.

6 Prototype Planning

6.1 Raw materials required for Prototyping:

List the possible materials and their properties that can be chosen for suitable parts of your prototype:

#	Material	Properties /Reason for selecting the material	Part Name and Number

6.2 Bill of Materials

Si No	Part Number	Part Name	Quantity	Material Specification

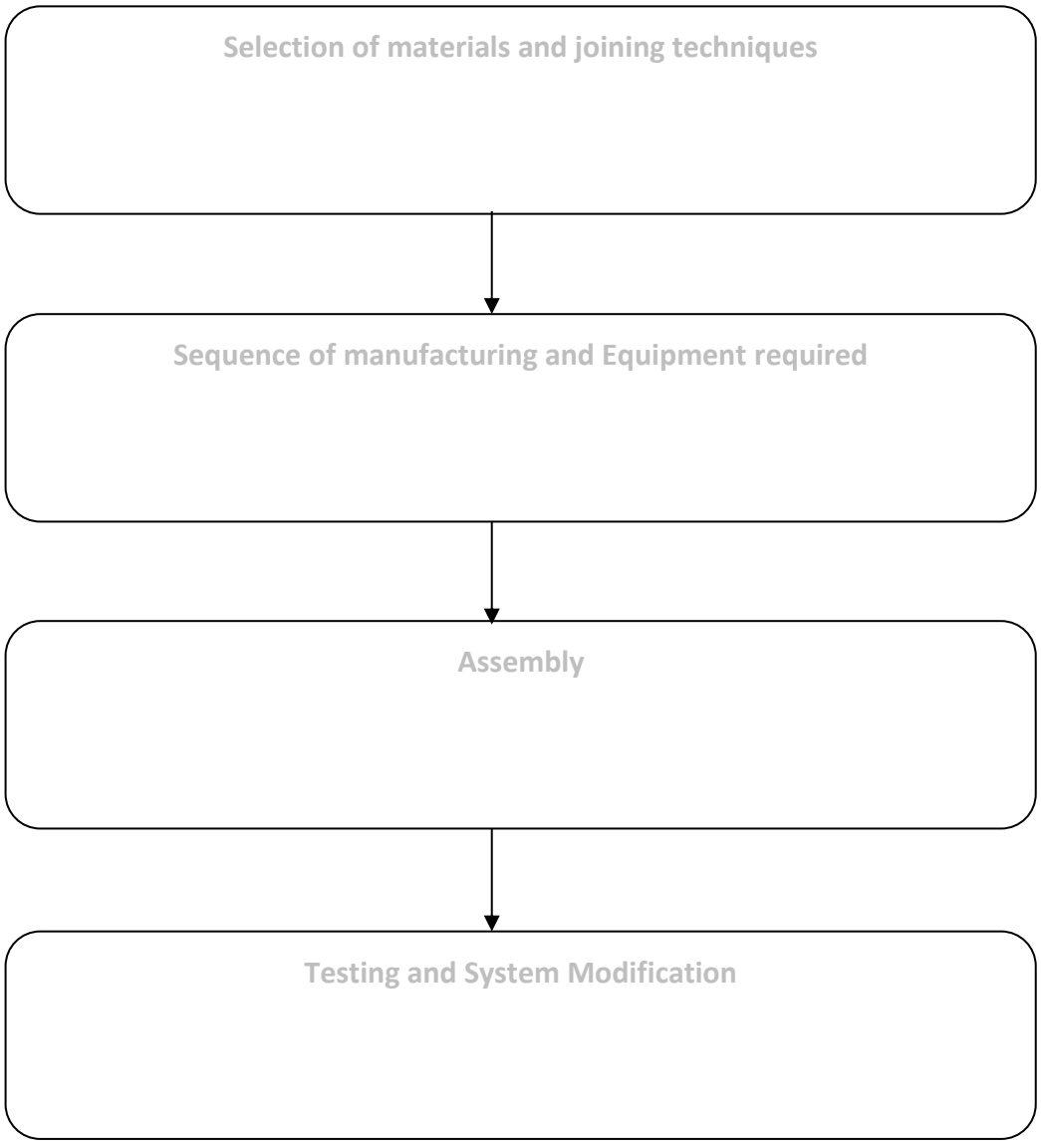
6.3 Joining techniques/ methods:

List the possible joining techniques that you may use in the prototyping process:

#	Joining Method	Material to be joined	Resources required and specification

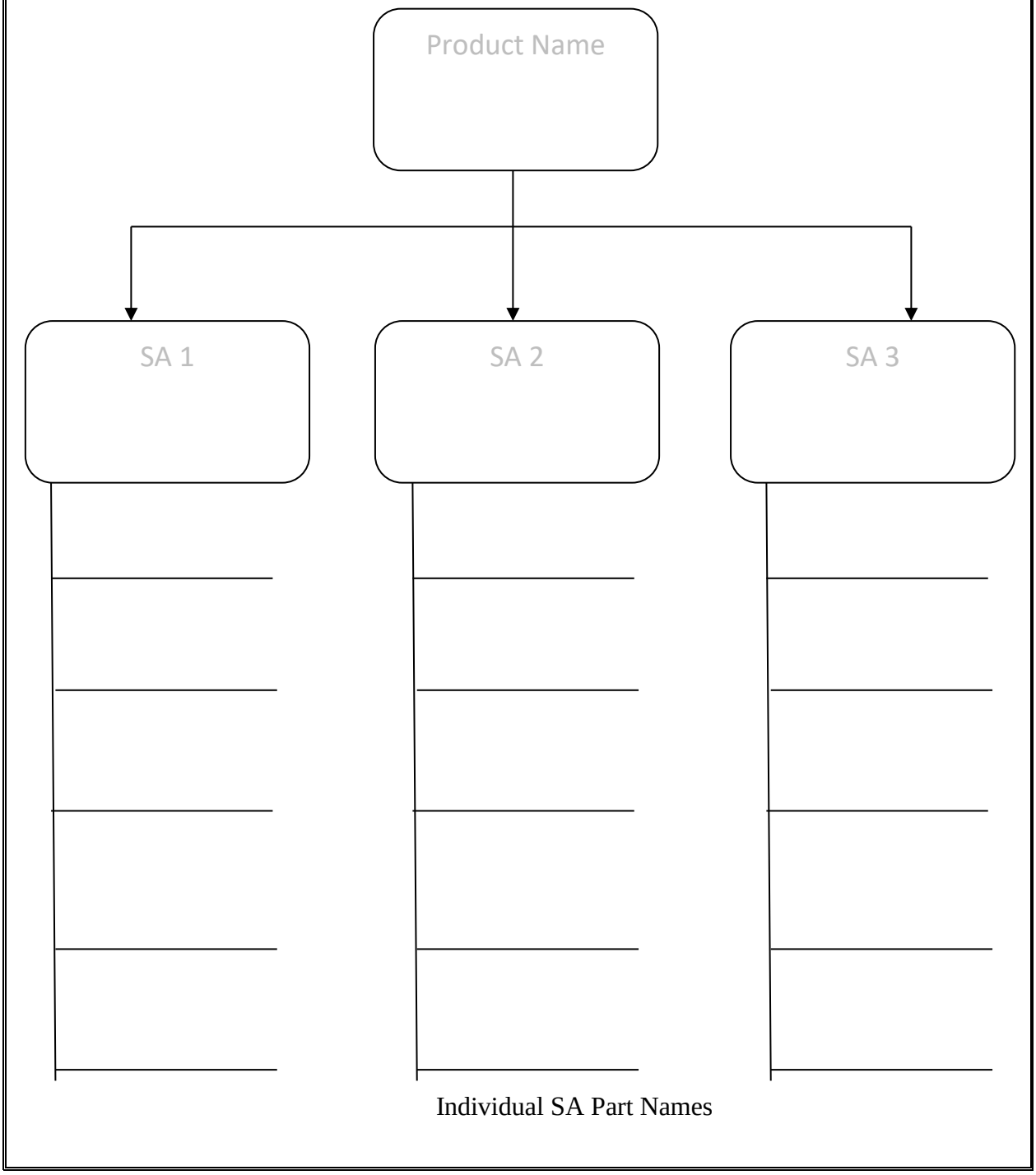
6.4 Flow Chart:

Prepare tentative flow chart of series of operation to be followed for prototyping:



6.5 Sub-Assembly Planning:

Plan to fabricate the Prototype in sub assemblies:



Individual SA Part Names

Sub Assembly #	**Brought out Parts**	**Manufactured Parts**
SA 1		
SA 2		
SA 3		

RUBRICS FOR REVIEW – I

PI Code	PI	Marks	Very Poor Up to 20%	Poor Up to 40%	Average Up to 60%	Good Up to 80%	Very good Up to 100%
3.1.1	Recognizes that good problem definition assists in the design process	04	Problem statement and objectives are not identified	Problem statement and objectives are not clear	Problem statement is clear and objectives are not in line with problem statement	Problem statement is clear and objectives are not completely defined.	Problem statement is clear and objectives are completely defined
3.1.2	Elicit and document, engineering requirements from stakeholders	04	No conceptual design for the projects	Draws only one view for the design, but does not Predict the working, without advantages or disadvantages, without Limitations, and without Manufacturing Cost estimation	Draws two view for the design, but does not Predicts the working, without advantages or disadvantages, without Limitations, and without Manufacturing Cost estimation	Draws three views for the design but does not Predicts the working, without advantages or disadvantages, without Limitations, and without Manufacturing Cost estimation	Draws all the three views and isometric views for the conceptual design and Predicts the working, advantages, Disadvantages, Limitations, and Manufacturing Cost
3.1.5	Explore and synthesize engineering requirements from larger social and professional concerns	04	Does not synthesize the engineering requirement for the identified problem.	Synthesizes the engineering requirement but does it partially.	Synthesizes the engineering requirement but does it considering 2 to 3 parameters.	Synthesizes the engineering requirement but doesn't fulfil the parameters.	Synthesizes the engineering requirement by considering all the parameters.
3.3.1	Apply formal multi-criteria decision making tools to select optimal engineering design solutions for further development	04	Teams not performed Pugh analysis and failed to prove the best solution.	Unable to use pugh chart to prove the best solution and failed to prove the best solution.	Used Pugh chart is unable justify best solution but leads to good solution.	Use Pugh chart to prove the selected concept is the best solution which provides intended solution.	Use Pugh chart to prove the selected concept is the best solution which provides intended solution. Provide statistics, graphs and evidences to prove the best solution.

3.2.2	Build models, prototypes, etc., to develop diverse set of design solutions	04	Does not build models or prototype.	Build models, prototypes showing vague functionality	Build models, prototypes showing least functionality	Build models, prototypes showing nominal functionality	Build models, prototypes showing maximum functionality

RUBRICS FOR REVIEW – II

PI Code	PI	Marks	Very Poor Up to 20%	Poor Up to 40%	Average Up to 60%	Good Up to 80%	Very good Up to 100%
3.2.2	Bill of mateials ”Build models/prototypes to develop diverse set of design solutions”	05	Does not have bill of material for fabrication.	Bill of materials is incomplete.	Show cases a vague Bill of material.	Show cases Bill of material, but partially complete.	Show cases Bill of materials for the complete product.
3.2.2	Fabrication	15	Does not build a working product.	Builds working product but finishing and aesthetics is incomplete	Builds working product but finishing and aesthetics are not upto the mark	Builds working product but finishing and aesthetics are nominal quality.	Builds working product with best finishing and aesthetics.

RUBRICS FOR REVIEW – III

PI Code	PI	Marks	Very Poor Up to 20%	Poor Up to 40%	Average Up to 60%	Good Up to 80%	Very good Up to 100%
4.1.3	Apply appropriate, instrumentation, and/or software tools to make measurements of physical quantities	05	Control system fails in getting the objective fulfilled	Control system is incomplete/inappropriate for the functionality	Uses Control system, but the objectives/ functionality executed partially	Uses Control system, but the objectives/ functionality executed partially	Uses Control system to perform the objectives/ functionality executed

Product in use:

Operating Instructions:

- Connect the android app to vehicle using WIFI & WIFI hotspot
- Read the control panel & instruction from the app.
- Keep the battery away from children & keep in cool place.

Team Members:

Name1: Akshay R Gadekar
Name2:Amir Munshi
Name3:Abhishek Gokak
Name4:Karthik Halakatti
Name5:Ajit Kulageri
Name6:Rahul Pasodi

Mentors:
Prof: Santosh Billur
Prof: Gururaj Fathepur

Contact:
Team leader name: Akshay Gadekar
Ph no. 8150900649
www.website.com
For more Demos, Videos and info scan the QR code:

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Minor Project Team #11

Introduction:

As one of the trends of development on automation and intelligence of agricultural machinery in the 21st century, the Problem is lack of mechanization in farming, required excess effort for different process, and required more man power and excess time consumption for performing individual process.Hence the problem is to design & manufacture a machine which will perform different operations in single machine with less man power.

Background/Introduction

Building a vehicle that has integrated with multiple farming tools to carry out required operation in an automotive vehicle, to reduce the operating problem, android app based control system is formed and controlled by IOT and WIFI system.

Objectives:

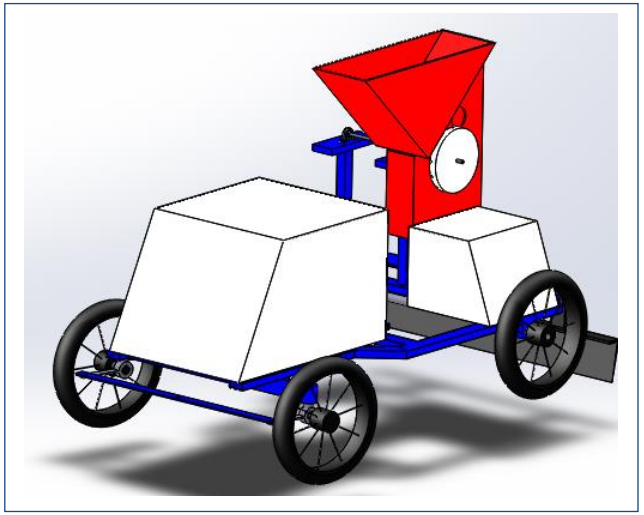
- ✓ To reduce farmers efforts
- ✓ Helpful to reduce the pollution
- ✓ IOT or WIFI controlled
- ✓ Multiple operation

Product Specifications:

Product specifications:

Si.	Engineering Specifications	Units
01	No of operation	3nos
02	Motor capacity	450rpm
03	Size	1*1.28*0.8m
04	Battery life for full charge	2to3 hr.
05	weight	70-80kg
06	Connectivity range	100-200m
07	No of rows sowing	2nos
08	Row spacing	6inch
09	Sowing depth	4inch
10	Size of grains can seed	1-10mm

3D Model:



Circuit Diagram/ Android App. /IoT Information