

MECHANICAL ENGINEERING

DESIGN PROCESS

Objectives

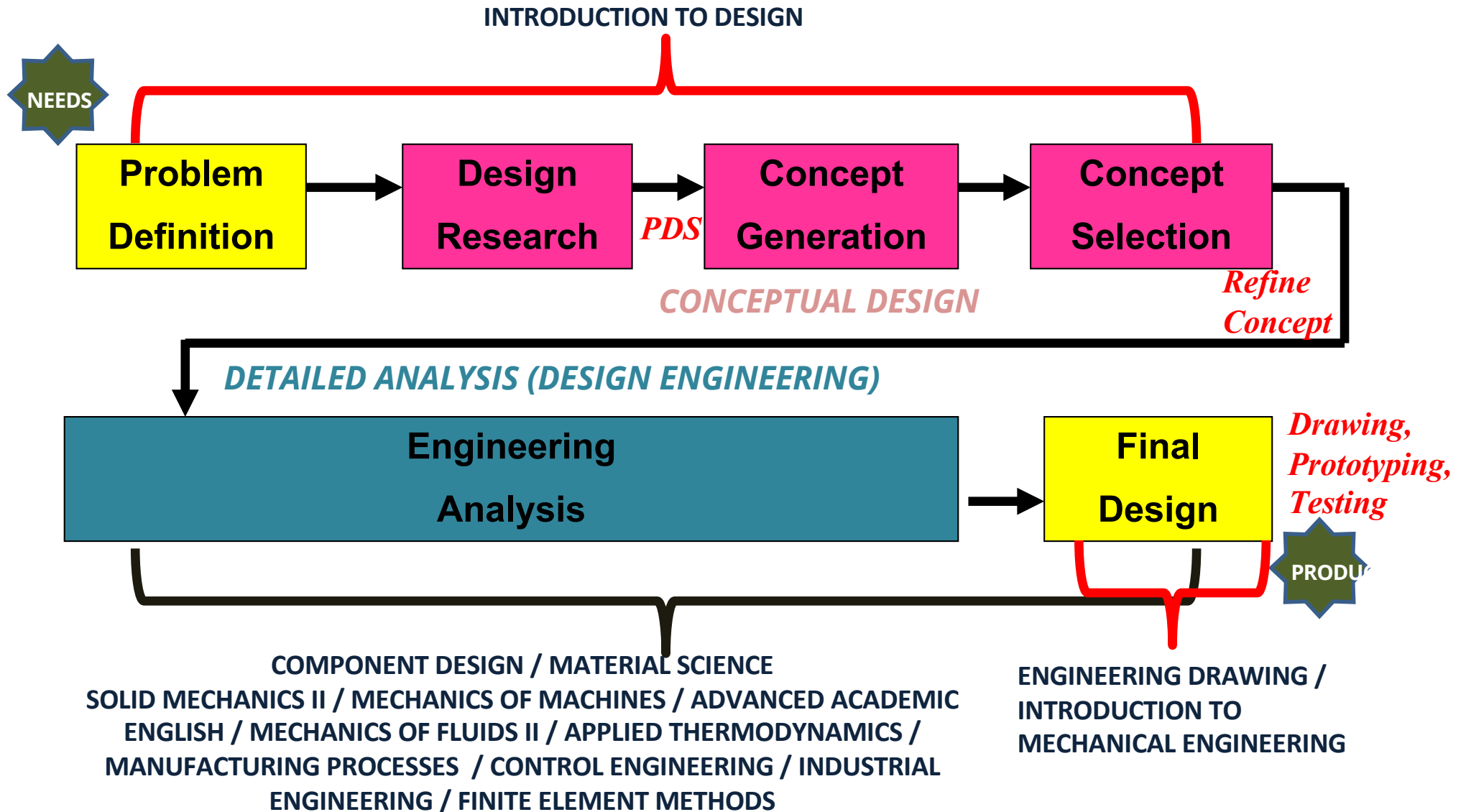
- To introduce engineering design process flow.
- To give exposure on what need to be done during design process.
- To acknowledge what are other mechanical subjects related in design process.
- To address the importance of engineering design analysis in innovation

DESIGN PROCESS

1. PROBLEM DEFINITION & DESIGN NEEDS
2. LITERATURE & MARKET REVIEW (DESIGN RESEARCH)
3. DESIGN SPECIFICATION (PDS)
4. CONCEPTS GENERATION
5. CONCEPT SELECTION EVALUATION
6. REFINE FINAL CONCEPT
7. ENGINEERING ANALYSIS
8. FINAL DESIGN
9. DRAWING & FABRICATION
10. MODELING, PROTOTYPING & TESTING



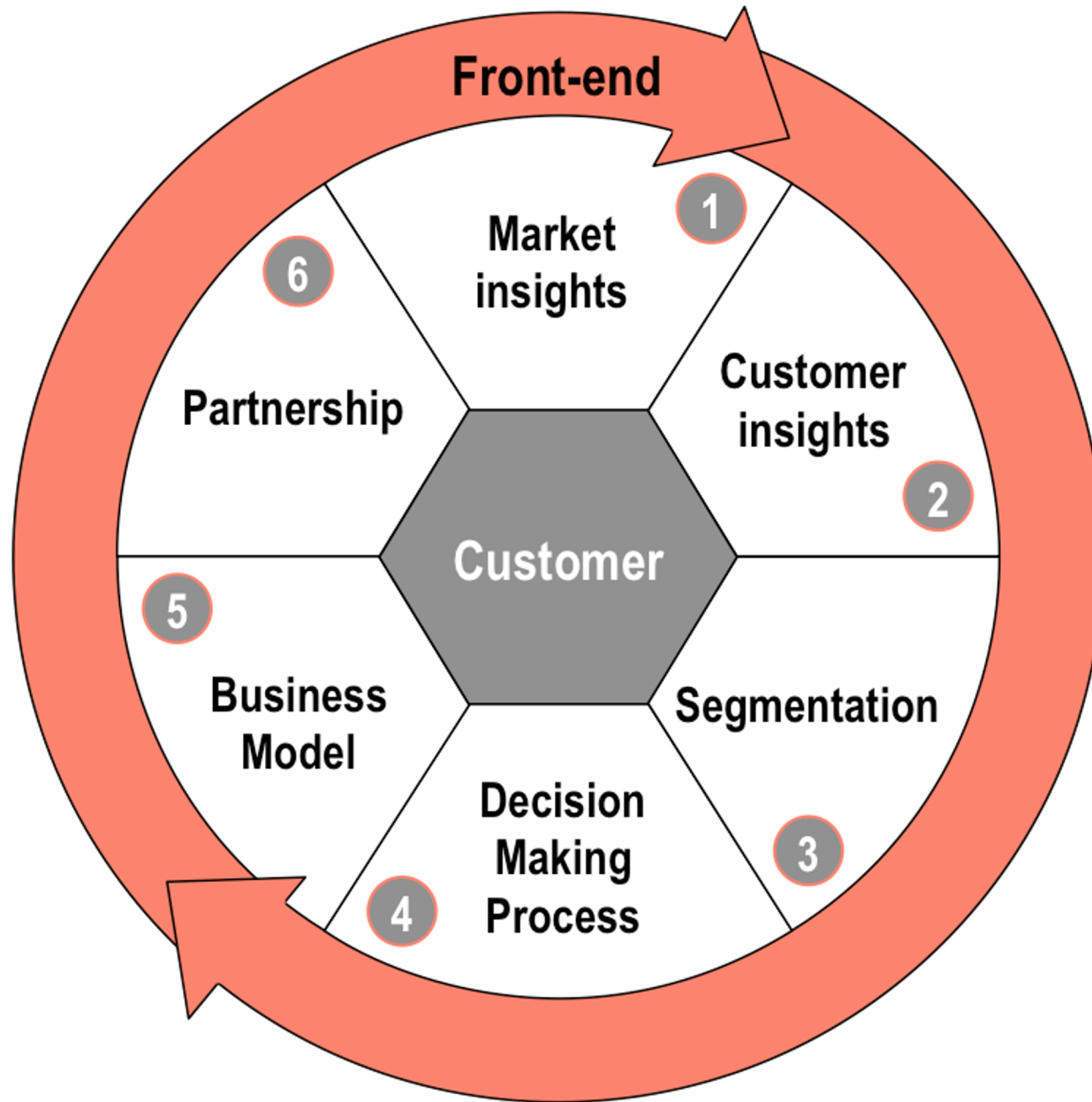
THE PRODUCT DESIGN PROCESS



PROBLEM DEFINITION & DESIGN NEEDS

- BRAINSTORMING SESSION – LISTING OF QUESTION AND REQUIREMENT.
- WHY NEED NEW DESIGN ?
- WHAT IS THE PROBLEM OF CURRENT EXISTING PRODUCT ?
- HOW THE NEW DESIGN WILL PROVIDES SOLUTION ?
- NEW REGULATION OR TREND ?

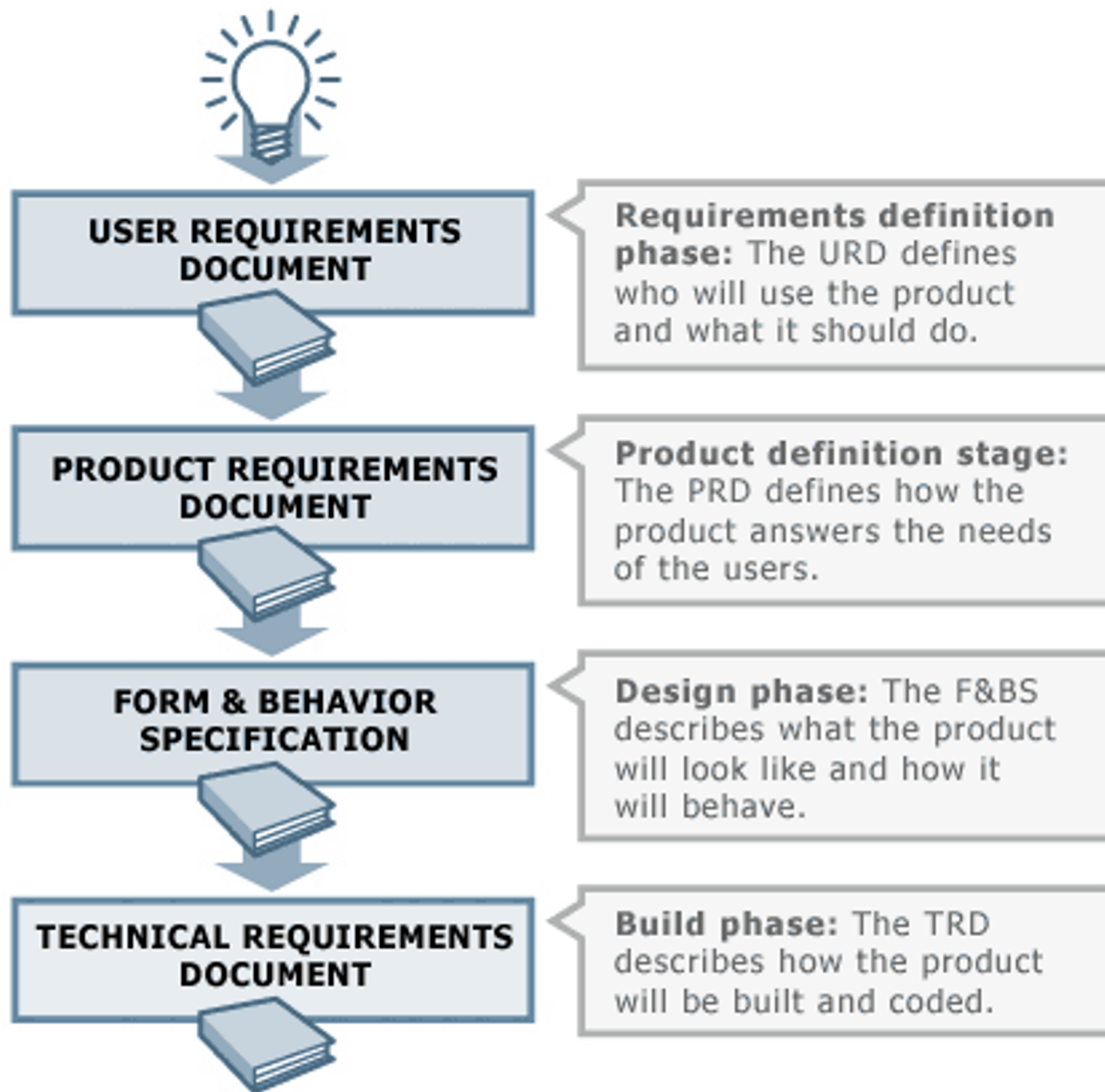
Design needs



LITERATURE REVIEW & MARKET SURVEY

- DO MIND MAPPING
- ORGANISE SPIDER DIAGRAM
- ASSIGN RESEARCH AREA
- PREPARE BRIEF NOTES
- DATA, TABLES AND CHARTS
- DEFINE LIMITATION
- DEFINE WORKING AREA/ DOMAIN
- DEFINE PARAMETRIC VARIANCES

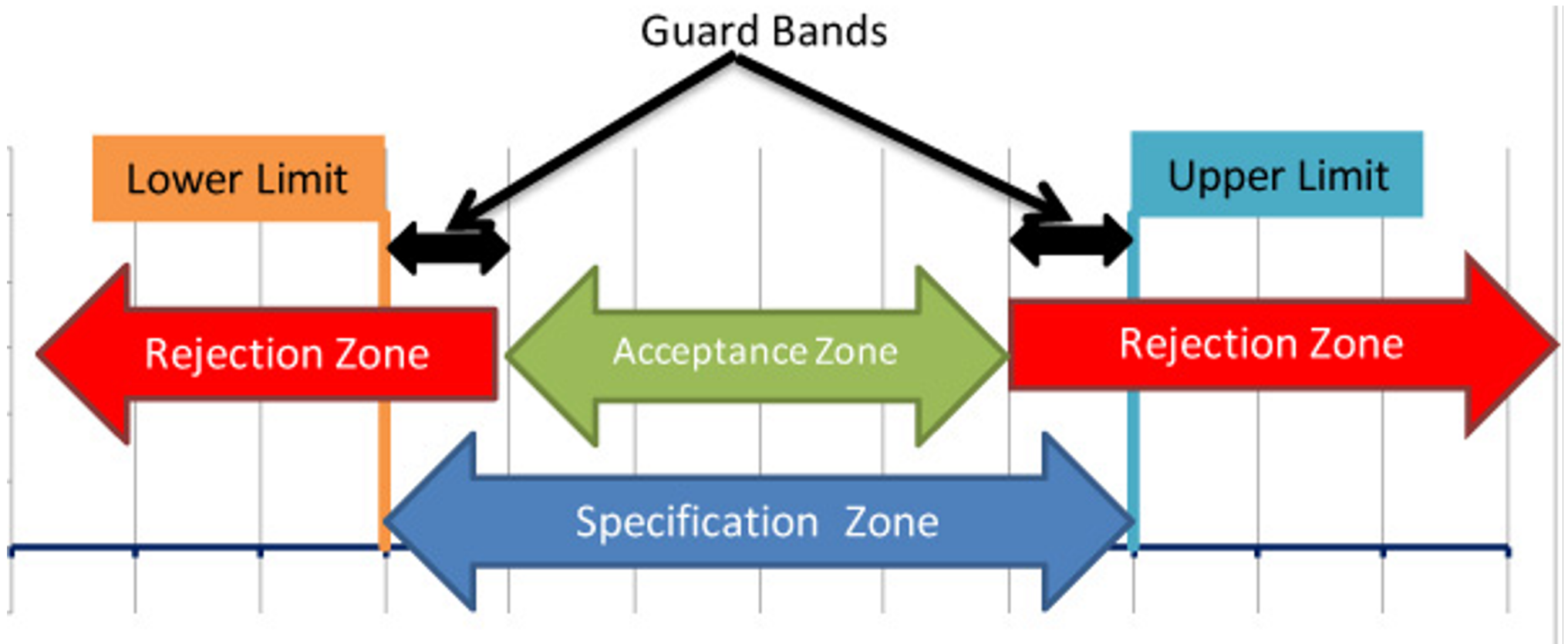
Needs into Specifications



DESIGN SPECIFICATION

- SET CLEAR LIMITATION – DIMENSION
COST WEIGHT CAPACITY
- PROVIDES WORKING DOMAIN FOR
DESIGNERS
- SET AS A GUIDE TO GENERATE CONCEPT
DESIGN
- TO PROVIDE DESIGN CONCEPT THAT WILL
NOT EXCEED OR PERFORM UNDER
REQUIREMENT.








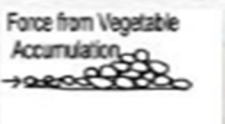








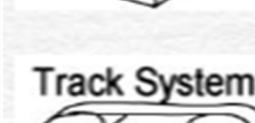

Specification (conclusion)



CONCEPT GENERATION

- CONCEPT IS AN INITIAL PROPOSE DESIGN SOLUTION
- NORMALLY MORE THAN ONE CONCEPT GENERATED (USE MORPHOLOGY CHART)
- PREPARE SKETCHING, NO DIMENSION REQUIRED
- CONCEPT MUST BE WORKABLE TOWARDS SOLVING PROBLEM
- FOLLOW ALL DESIGN SPECIFICATION AND FULLFILL DESIGN NEEDS

MORPHOLOGY CHART

	Option 1	Option 2	Option 3	Option 4
Vegetable Picking Device		 Triangular Plow	 Tubular Grabber	 Mechanical Picker
Vegetable Placing Device	 Conveyor Belt	 Rake	 Rotating Mover	 Force from Vegetable Accumulation
Dirt Sifting Device	 Square Mesh	 Water From Well	 Slits in Flow or Carrier	
Packaging Device				
Method of Transportation		 Track System	 Sled	
Power Source	Hand pushed	Horse drawn	Wind blown	Pedal driven

CONCEPT SELECTION

- SELECTING THE BEST CONCEPT
- CREATING SELECTION CRITERIA BASE ON ERGONOMIC, MAINTENANCE, OPERATION, PERFORMANCE
- CRITERIA WEIGHTAGE
- MATRIX EVALUATION TECHNIQUE

Design criteria matrix

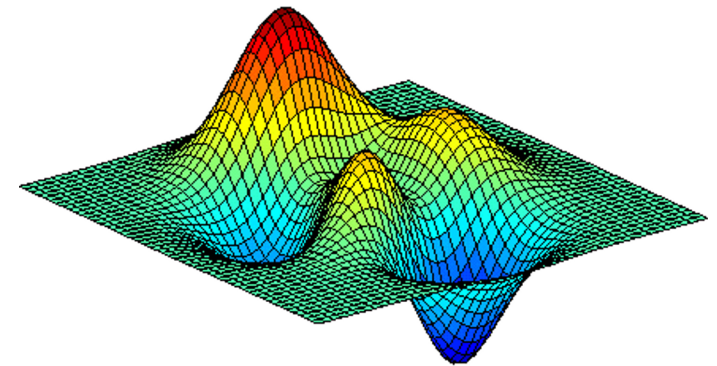
ROW	CRITERIA	WEIGHTS
1	Easy to attach	7
2	Easy to detach	4
3	Fast to attach	3
4	Fast to detach	1
5	Attach when bike dirty	3
6	Detach when bike dirty	1
7	Not mar	10
8	Not catch water	7
9	Not rattle	8
10	Not wobble	7
11	Not bend	4
12	Long life	11
13	Lightweight	7
14	Not release accidentally	10
15	Fit most bikes	7
16	Streamlined	5

EVALUATION MATRIX

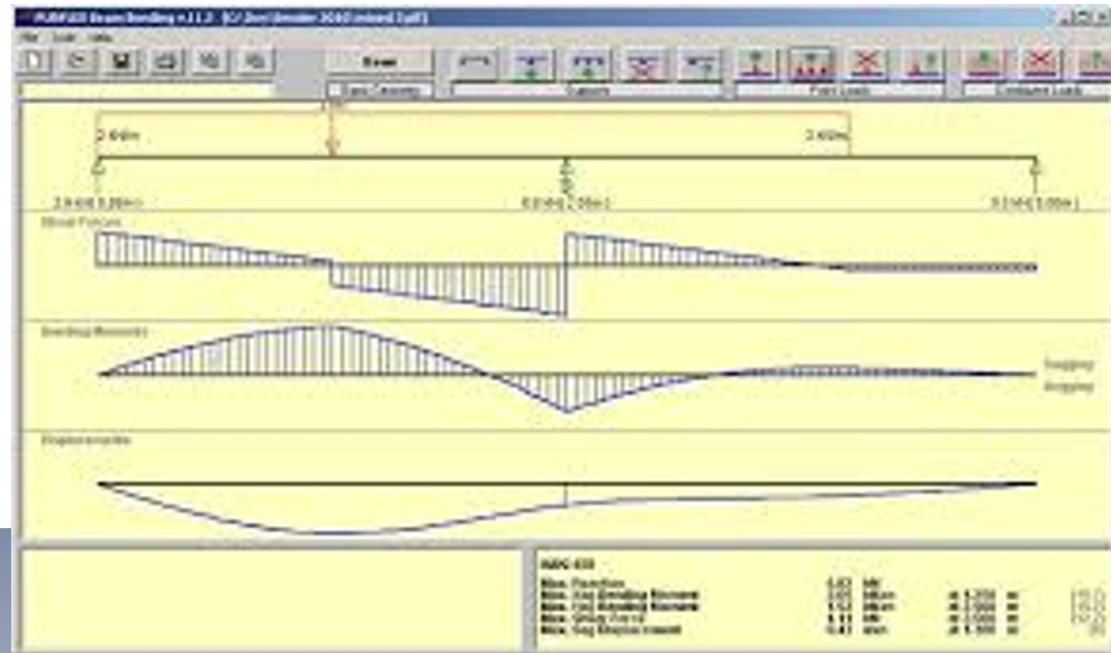
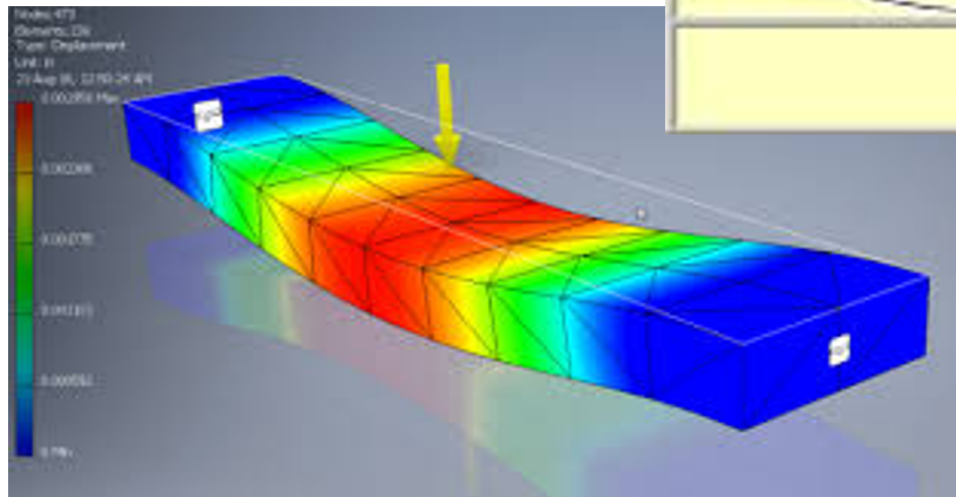
	weight	concept 1	concept 2	concept 3
controllable on velocity and direction	2	5	2	2
safe	3	6	3	3
gain enough speed	4	3	4	4
basic construction simple	1	7	5	1
well accesible parts	2	8	5	2
distinct	4	4	7	4
stable	3	3	8	3
compact	1	6	3	1
springs	1	8	2	1
price	3	7	5	3
total score		125	130	89

ENGINEERING ANALYSIS

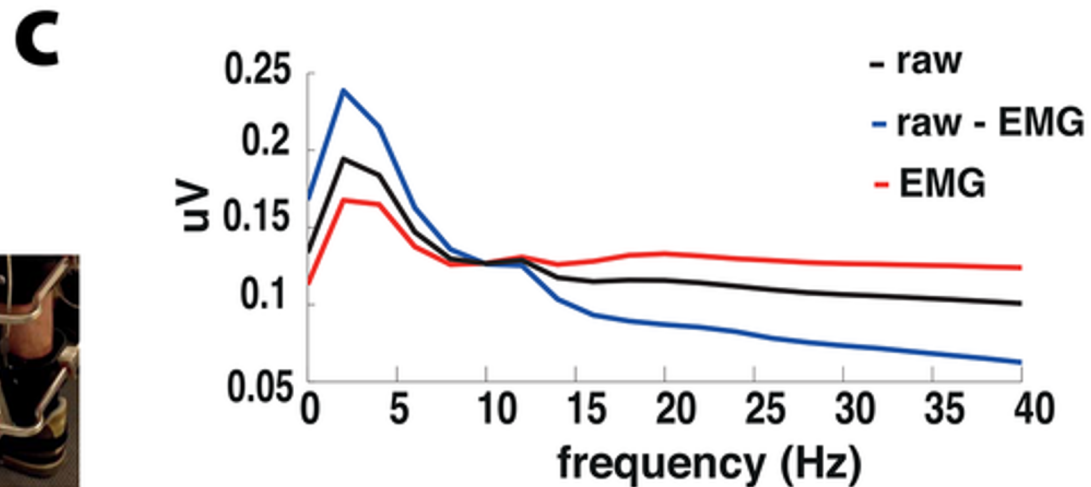
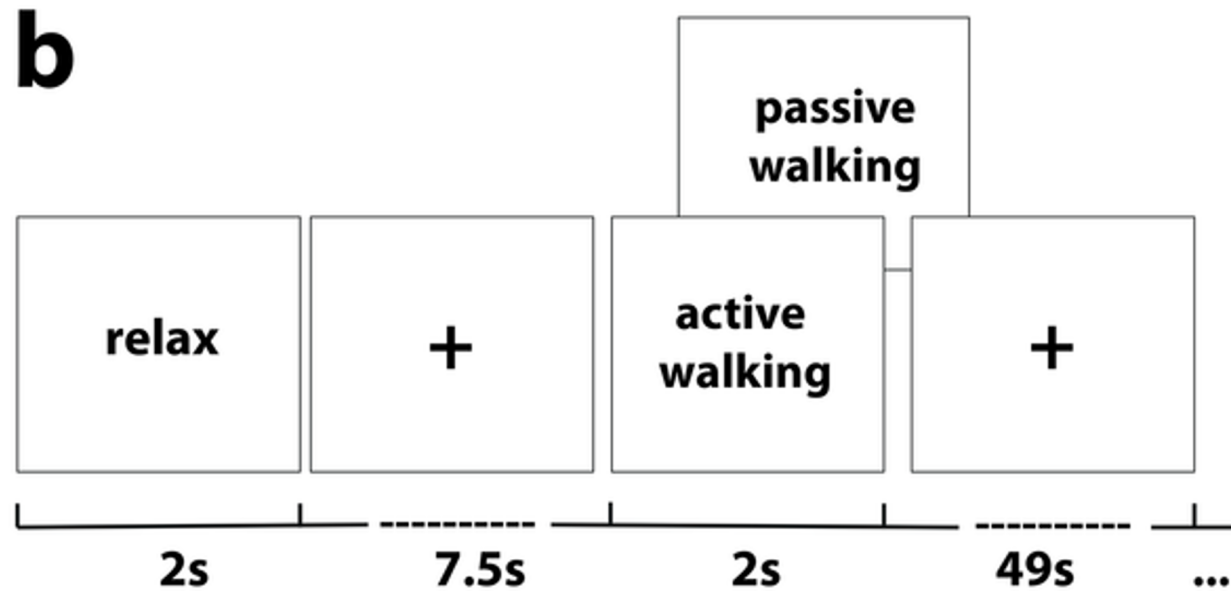
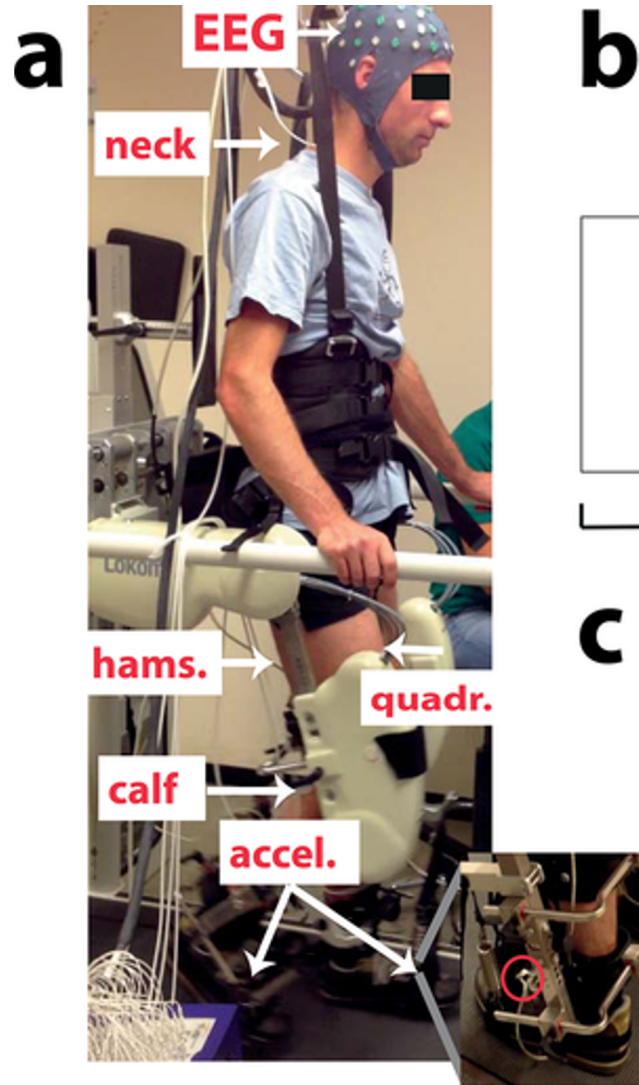
- STRESS DISTRIBUTION
- SAFETY FACTOR
- FATIGUE ANALYSIS
- DURABILTY
- COMPONENT SELECTION
- MATERIAL SELECTION



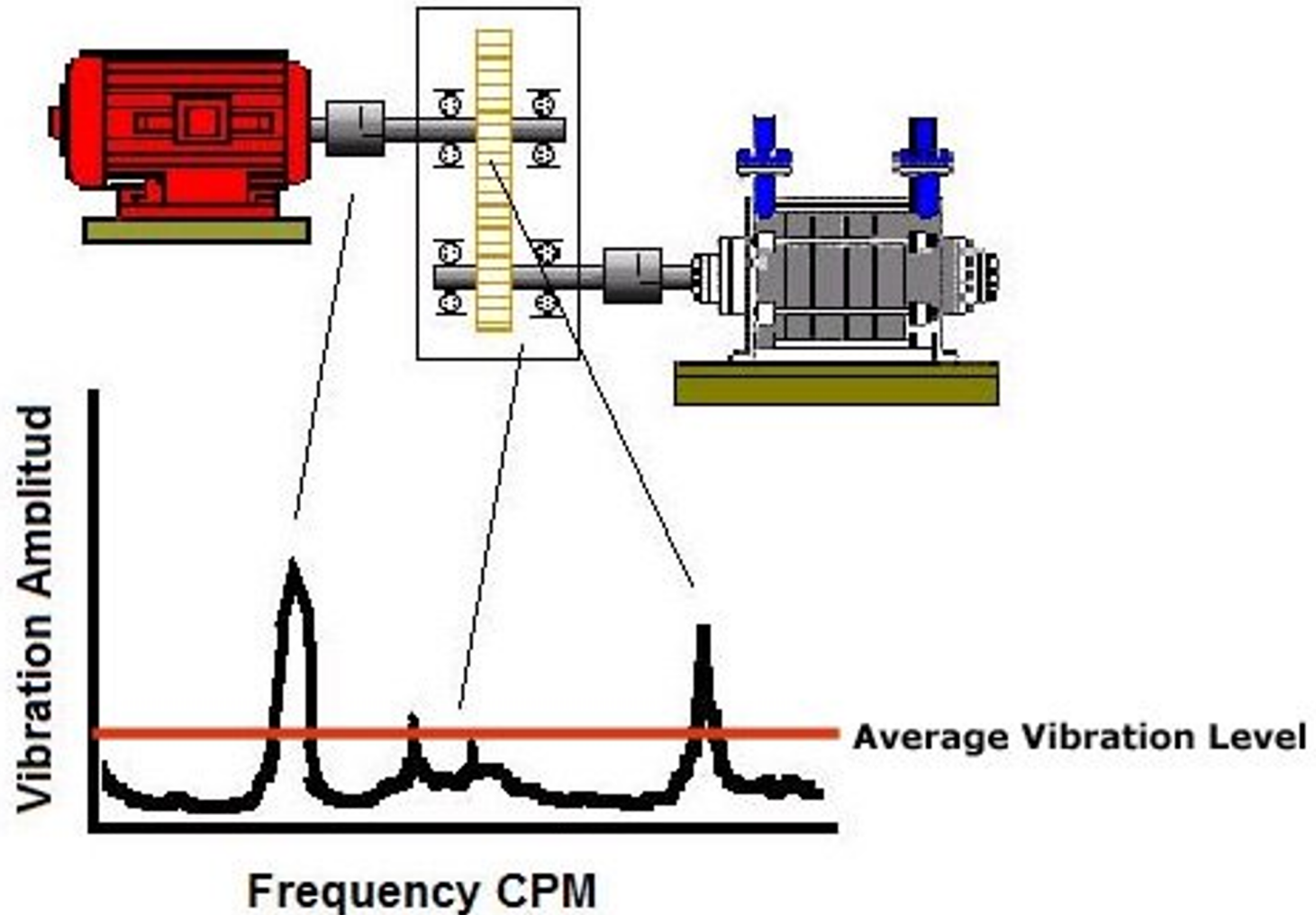
Bending Stress Analysis



Human walking analysis



Vibration analysis



FINAL DESIGN

- FULLY SATISFY DESIGN SPEC AND NEEDS
- CLEAR SCHEMATIC AND DRAWING
- FOR SYSTEM OR PROCESS -
ALGORITHM AND FLOWCHART
MUST BE WELL DEFINE
- VIRTUAL 3D MODEL

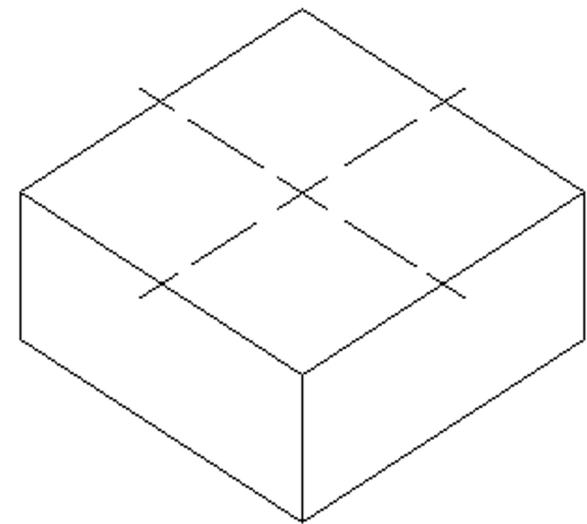


3D Model

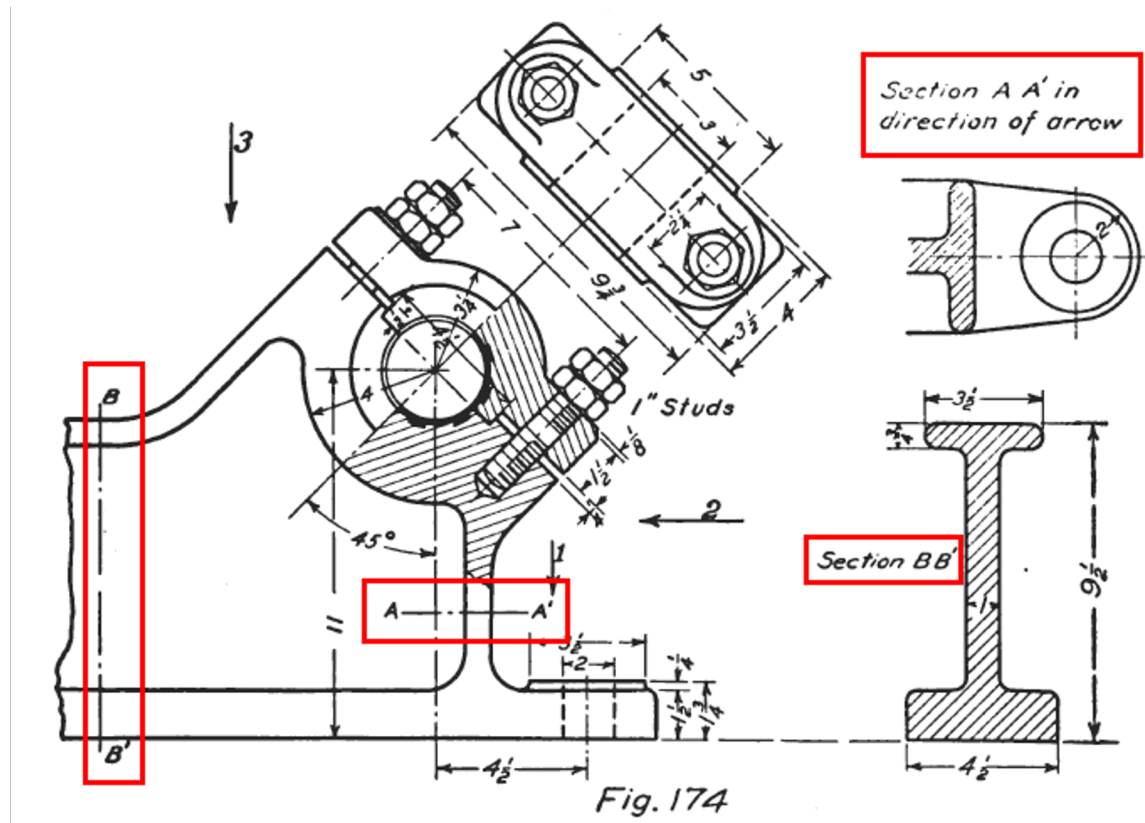


DRAWING & FABRICATION

- 2D OR 3D MODEL
- ORTHOGRAPHIC AND ISOMETRIC
- EXPLODED AND SECTIONAL DWG
- ASSEMBLY DWG
- PRODUCTION DWG
- PARTS MACHINING AND FABRICATING



Sectional dwg



Fabrication

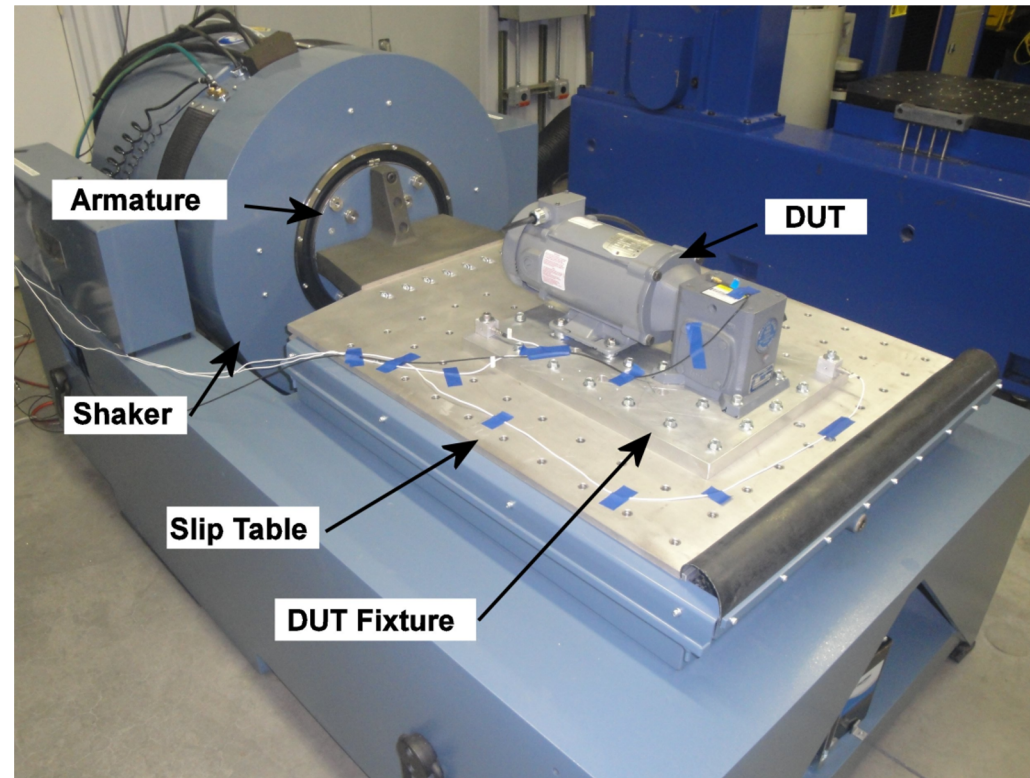


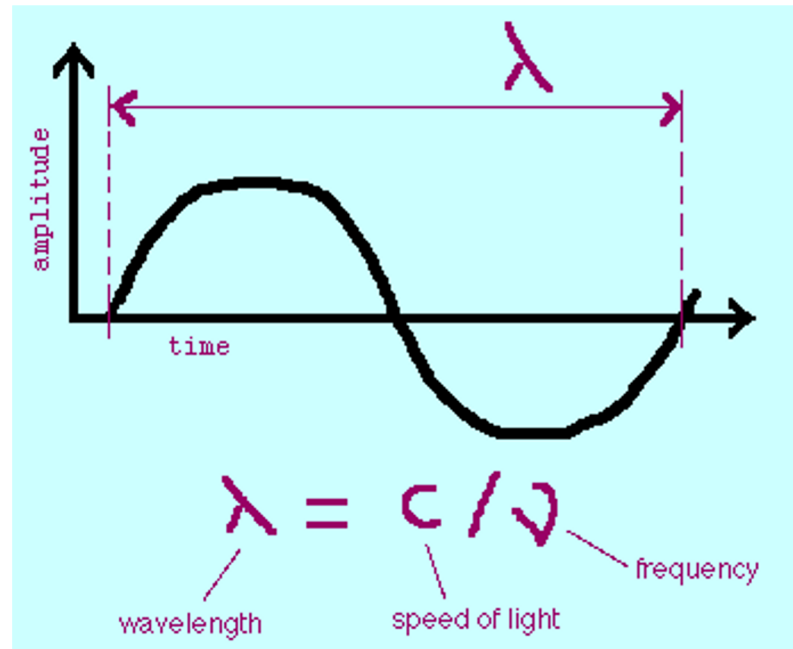
PROTOTYPE AND TESTING

- COMPLETE DESIGN ASSEMBLY
- SETTING AND FINE TUNING
- SERIES OF TESTING AND EVALUATION AND IMPROVEMENT
- FINAL PRODUCT REFINING BEFORE PRODUCTION



Prototype testing





The end

Thank you