

**EDUCATIONAL CHAIN DRIVE, BELT DRIVE
AND GEAR MECHANISM**

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SESI 2 - 2022/2023

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ABSTRAK

Terdapat beberapa kelemahan pada metodologi pembelajaran gear dari segi produktiviti sebenar kerana ia berada di dalam mesin dan ia adalah mencabar untuk memahami cara ia berfungsi dan apa yang dilakukan oleh setiap komponen. Matlamat projek ini untuk mencipta pendidikan pembelajaran yang menunjukkan cara gear, tali pinggang dan rantai berfungsi dalam mesin. Mengawal pergerakan gear, tali pinggang, rantai dan galas adalah perlu untuk penciptaan prototaip ini. Menggunakan perisian pencipta, lukisan teknikal telah dicipta skop projek ini. Prototaip kemudiannya dibuat berdasarkan lakaran. Pergerakan berputar dibuat menggunakan gegancu dan rantai. Bahagian mekanikal ini disambungkan dengan rantai dan gegancu. Matlamat projek telah dicapai daripada hasilnya.

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TOPIC 1

INTRODUCTION

1.1 INTRODUCTION

A gear is a particular kind of rotating part that contains teeth and tooth gaps on the outside of it. This form enables the gear to be attached to other parts, such as wheels and rods, that have teeth that match, allowing for the smooth transfer of rotational torque. Transmissions are devices that combine two or more gears to produce mechanical benefits. As a result, they can be regarded as simple machines. Devices used for transmission frequently employ gear. Gear devices may transmit power at a different speed, torque, or direction than the power source depending on their design and arrangement. Depending on the type of teeth and the shape of the gear itself, there are several sorts of gears.

1.2 HISTORY OF THE PROJECT

The project that will be developed aims to make the student learning process simpler, particularly for students who enroll in the engineering programme at the Polytechnic Institute (MECHANICAL) or other engineering students.

1.3 PROBLEM STATEMENT

The primary contributing factor to the issue is the need for careful observation when designing the machine, particularly with regard to the choice of gears.

Another issue is the requirement for an appropriate concept in the design for the use of student learning.

Last but not least, take extra precautions to prevent harm within the gear machine.

1.4 OBJECTIVES

1.4.1 Produce a educational gear kit that can save users time for get the desired quantity.

1.4.2 Design a gear kit that helps students learn.

1.5 SCOPE PROJECT

1.5.1 The operating speed of the motor is 300rpm.

1.5.2 Employ seven different types of equipment which is rack and pinion, motor, belting and pulley, chain drive and bevel gear.

1.5.3 Runs with DC 24V Watt Motor.

1.6 ADVANTAGES OF PROJECT

Students can gain a lot from this Educational Gear drive, Belt drive and Chain drive Mechanism. It is simple to comprehend, simple for lecturers to teach and helps students learn more. Gears can be used to change the speed, torque and direction of a power source. One of the different sizes will create a change in torque, offering mechanical benefits through their gear ratio. Gear needs less maintenance is required.

TOPIC 2

LITERATURE REVIEW

2.1 INTRODUCTION

This gear learning tool was developed to assist instructors and students in understanding how to explain gear. Where each component can be felt, tools can be manipulated and each method of operation can reveal information work. This equipment is simple and straightforward to maintain because it is simple to get in any store or online. Because the scope of instruction about this equipment is included in the learning curriculum, it will be located in the test lab.

2.2 PREVIOUS STUDIES

According to earlier studies, this gear learning method can aid students in developing a deeper understanding of the concept, the purpose and different kinds of gears, as well as the gear-driving instruments including belting bearing rack and pinion.

Additionally, this invention increases students' interest in learning the subject, and the idea can aid lecturers in clearly explaining each portion.

This innovation can reduce the amount of time that lecturers need to explain things.

clear image of the equipment.

2.3 COMPONENTS

2.3.2 Belting

The purpose of belting is to absorb high friction from the transmission of rotational power. Other pulleys attached to the crank shaft pulley without slipping or dragging

2.3.3 Pulley

A V-belt or T-belt holder is located on a production machine's pulley, which is one of the pieces or components of the machine.

2.3.4 Rack and pinion

A set of gears known as an ack pinion gear is frequently employed in industrial plants, particularly on machines that move or change positions. Because this Rack Pinion Gear serves as a gear for engine components, it moves or changes position when the engine component does.

2.3.5 DC 24V 240watt Motor

A particular kind of DC motor that doesn't revolve constantly is a stepper motor. An entire revolution is instead broken up into many equal steps. A stepper motor is made up of phases, which are collections of many coils. The stepper motor turns one step at a time by sequentially supplying energy from the input voltage to each phase. Therefore, a stepper motor converts electrical energy or digital input pulses into mechanical shaft rotation.

2.3.6 Chain drive

Chain drive are most commonly used to transmit power between two components that are at a greater distance, but they may also be used for short distances. They may also be used for short distances. They are one of the five most frequently used mechanical power transmission methods alongside shaft couplings, gear drive, belt drives and lead screws.

2.3.7 Bevel gear

Bevel gears are power transmission components primarily used to change the direction of shaft rotation and to decrease speed and increase torque between nonparallel rotation shafts. They are used on shafts with intersecting axes and in special cases on shafts whose axes do not intersect.

TOPIC 3

METHODOLOGY

Methodology refers to the techniques, procedures, techniques, and approaches used to carry out the project's objectives and aims. A clear, thorough explanation of the work process that is in accordance with the Gantt chart-based work plan is required.

3.1 INTRODUCTION

3.2 SELECTION OF MATERIALS AND COMPONENTS

3.3 TECHNICAL DRAWING

3.4 LIST OF MATERIALS

3.5 FABRICATION PROCESS / PROGRAMMING

3.6 OPERATIONAL TESTING

3.7 PROJECT TABLE (GANTT CHART)

3.1 INTRODUCTION

This chapter discusses the work process that has been carried out on the implementation of work, equipment and materials to be used during the workshop. Process work carried out during the process of building a gear machine. It is also stated about the concept of work used which is the concept of PRIME work.

Among the working methods carried out during the implementation of this project is sketching the design concept of the gear machine, the method of assembling the machine frame, the method of mechanical movement used and other methods involved.

Methodology is very important to help the project run smoothly. In addition, the methodology makes it easier for someone to know about the ongoing project because it includes all the processes in completing it in an orderly manner. A flow chart showing the manufacturing process is shown in Figure 3.1.

PROJECT FLOWCHART

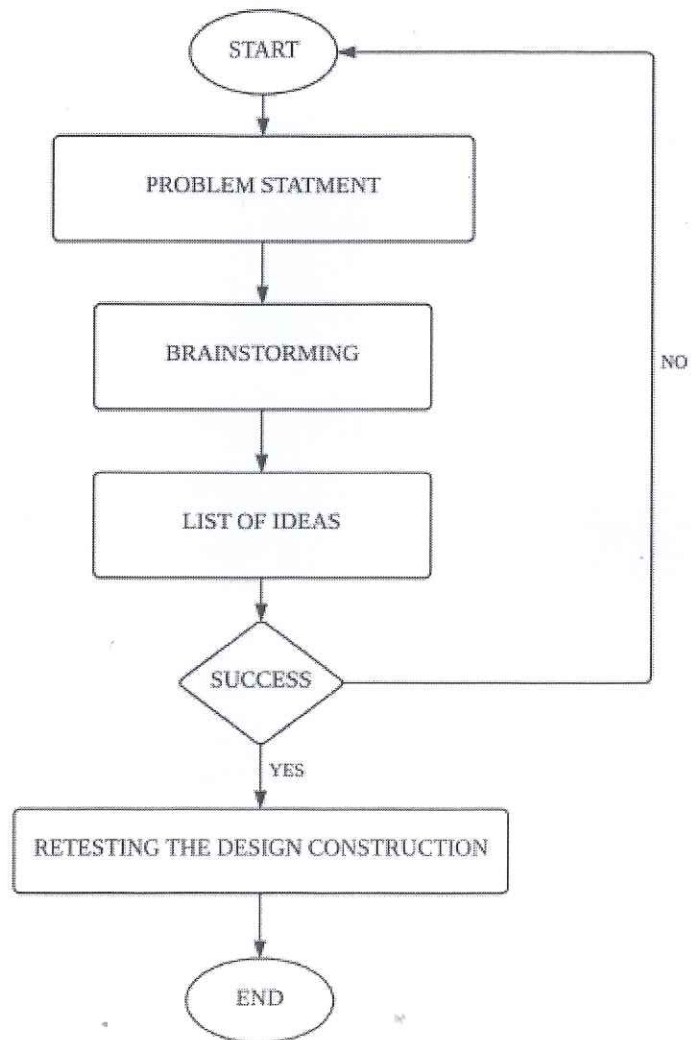


Figure 3.1 Manufacturing process

3.2 SELECTION OF MATERIALS AND COMPONENTS

Firstly, there are two difference design of our project which sketch with high potential. The following figure 3.2.1 and 3.2.2 shows how the design of our project were sketch.

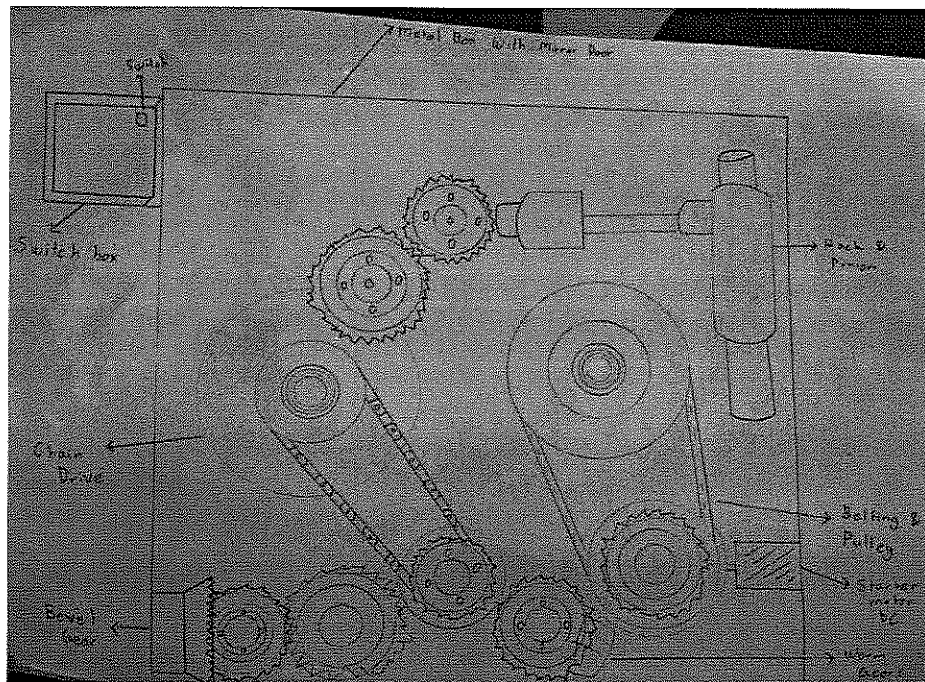


Figure 3.2.1 Project Sketch 1

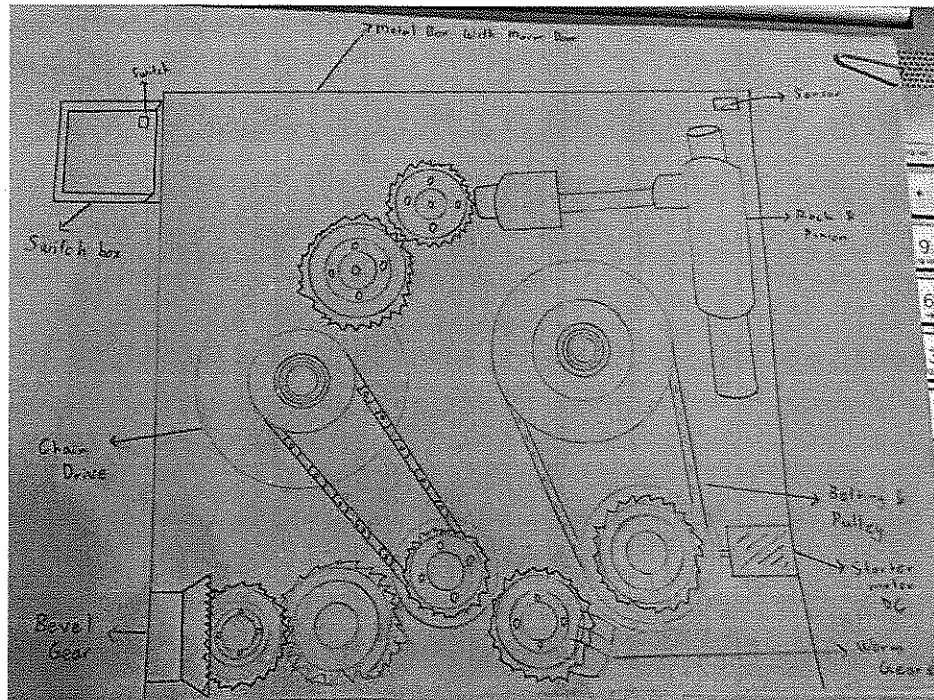


Figure 3.2.2 Project Sketch 2

The figure above shows the design of our project with and without sensor. The purpose of adding sensor is to avoid the crash. The sensor device is to detect or sense the approach or presence of nearby objects. This is to avoid the physical contact between one object and another.

3.2.1 Analysics between the two design.

Table 3.2.1 Analysics between the two design

Suggestion	Advantage	Disadvantage
Suggestion 1	• Easy to build • Low cost	• Accident may occur • Not properly managed
Suggestion 2	• Better design • Avoid crash from each other	• High cost

The best design will be choosed according to the matrices marks. There are 3 criteria to count on to choose the best design. Table 3.2.2 shows the difference of criteria of the design.

Table 3.2.2 Difference of criteria of the design

No	Criteria	Idea 1	Idea 2
1	Advantage	4	6
2	Project Cost	5	4
3	Design	3	6
	Total	12	16

Lastly after all the decision and referring to criteria-criteria above , we managed to select the second design as the final sketch.

3.3 TECHNICAL DRAWING

The use of computer technology to help shape, process, optimise, and specifically make sketches (technical & engineering drawings) of a part or the full project design is known as design employing software (Autodesk Inventor Professional 2023) The assembly drawings, bill of materials, isometric drawings, and overall project drawings are displayed in Figures 3.3.1, 3.3.2, and 3.3.3.

PROJECT TITLE

(EDUCATIONAL CHAIN DRIVE, BELT DRIVE AND GEAR MECHANISM)

i) Technical Drawing and Bil of Material

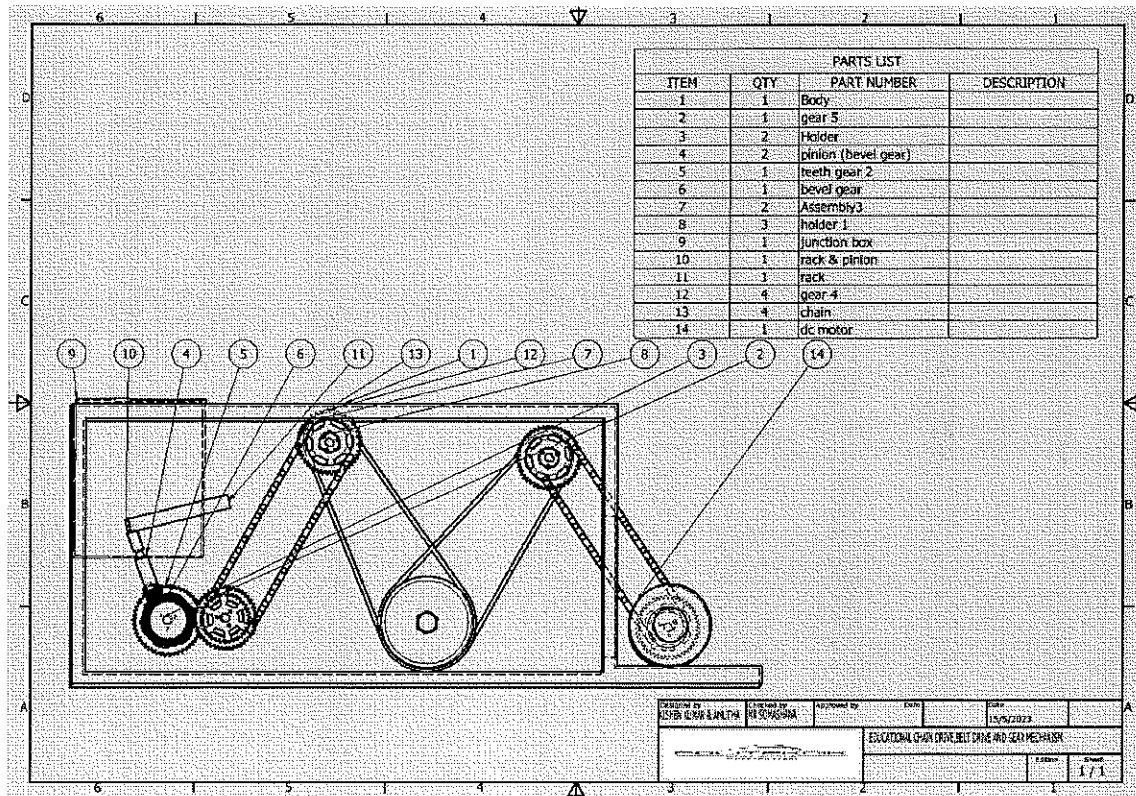


Figure 3.3.1 Technical Drawing and Bil of Material

Figure 3.3.1 shows the technical drawing and bill material of project which assembly together all the parts to one unit. First of all, gears use mild steel as material example of gears is teeth gear, worm gear, rack and pinion, helical gear, bevel gear. Besides, holder, body, switch box, starter motor DC and speed control is mild steel and the switch use plastic as material to this project.

ii) Isometric View

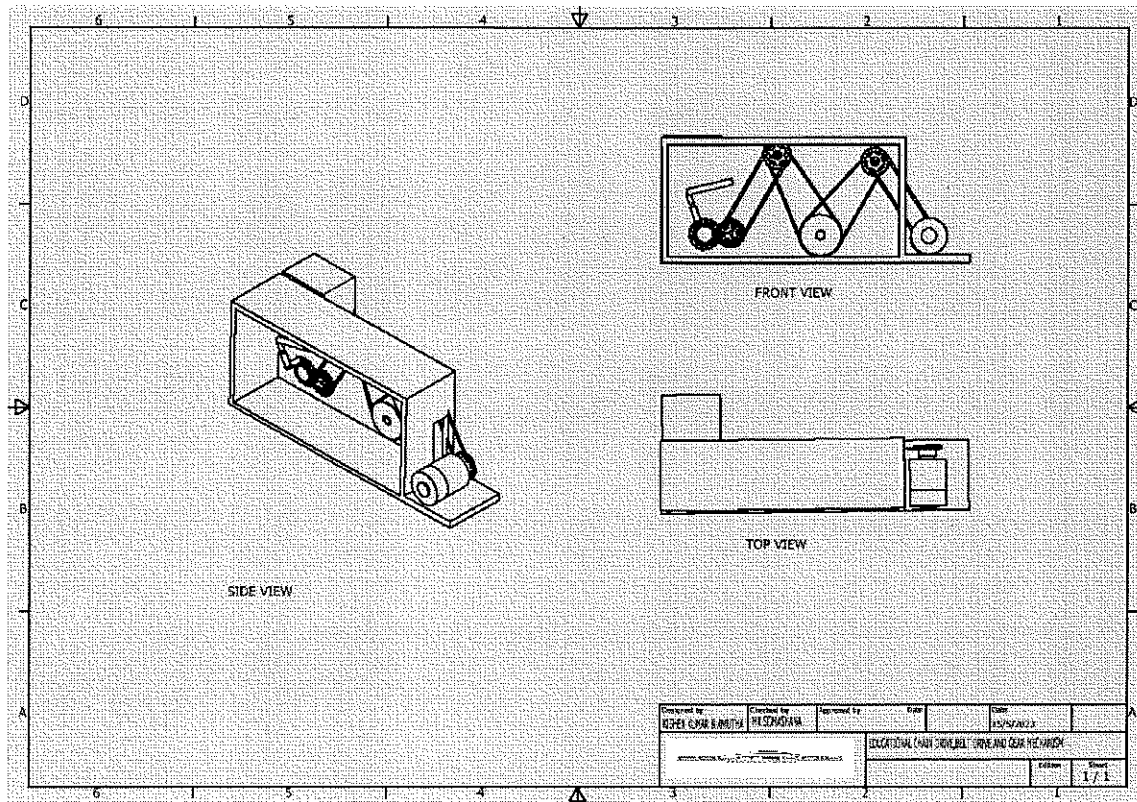


Figure 3.3.2 Isometric View

Figure 3.3.2 shows the view of top, front and right of project. To display a 3D object on a 2D sheet, isometric drawings are frequently used in technical drawing. Drawings with an isometric perspective are useful for displaying dimensions and how parts fit together.

iii) Assembly Drawing

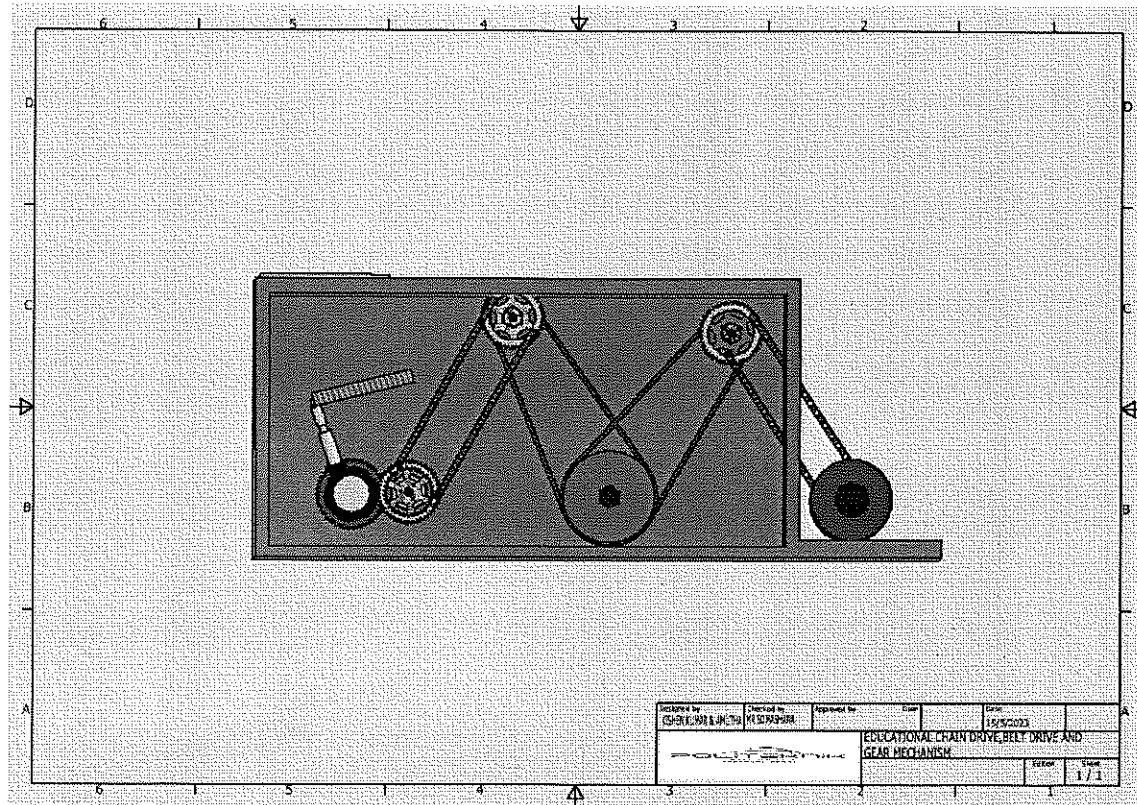


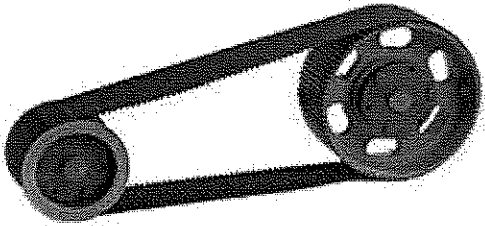
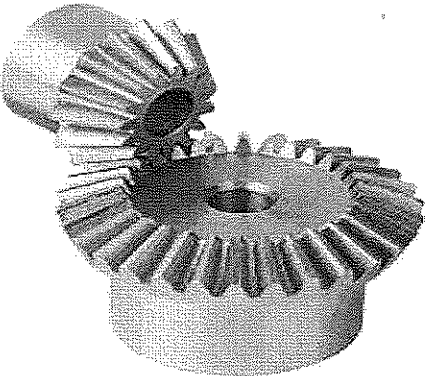
Figure 3.3.3 Assembly Drawing

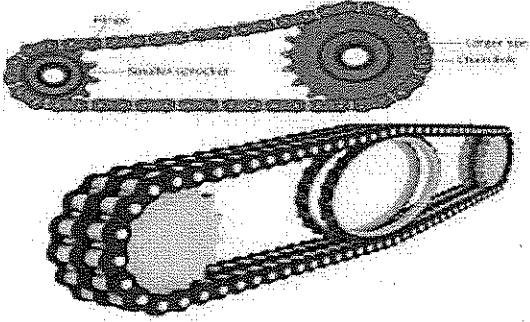
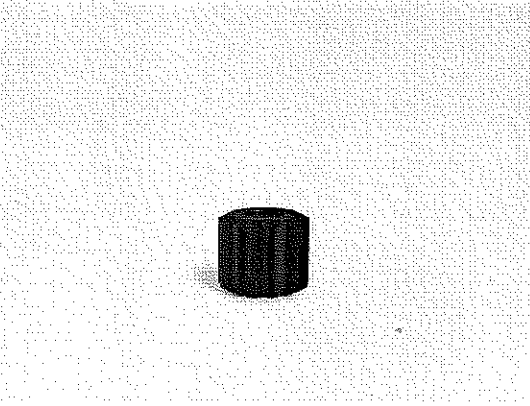
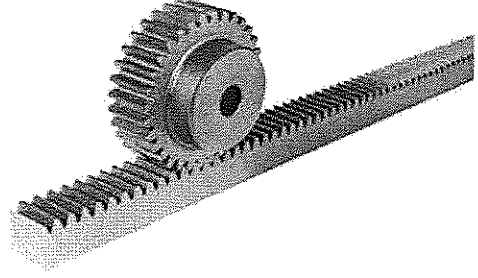
Figure 3.3.3 shows the overall assembly drawing of educational gear drive, belt drive and chain drive mechanism to get clear picture of the project design for fabrication process. Besides, this assembly drawing will make all the collection of parts to single unit by combinations.

3.4 MATERIALS AND COMPONENTS

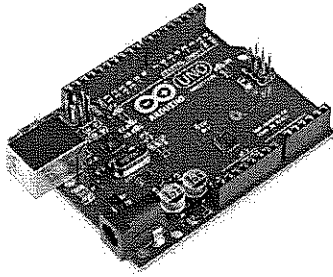
The process of selecting materials and components is the most important factor when producing a new power generator to control expenses and reduce production costs. The selection of materials and components must follow the desired specifications to avoid the project being produced inefficiently and the selection of wrong materials and components may result in the project failing to function as drafted. The materials and components specified under the main materials to produce the project.

Table 3.4.1 List of materials

MATERIALS	USES
BELT DRIVE 	To absorb high friction from the transmission of rotational power. Other pulleys attached to the crank shaft pulley without slipping or dragging.
BEVEL GEAR 	Bevel gears are power transmission components primarily used to change the direction of shaft rotation and to decrease speed and increase torque between nonparallel rotation shafts. They are used on shafts with intersecting axes and in special cases on shafts whose axes do not intersect.

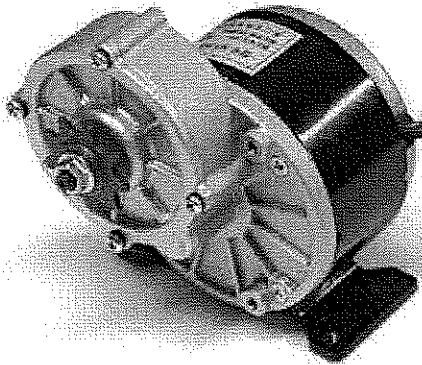
BODY 	Made up of steel.
CHAIN DRIVE 	Used to transmit power between two components that are at a great distance but they may also use for short distances. They may also be used for short distances. They are one of the five most frequently used mechanical power transmission methods alongside shaft couplings, gear drive, belt drives and lead screws.
HOLDER 1 & 2 	To hold chain drive and belt drive
RACK & PINION 	A set of gears known as an ack pinion gear is frequently employed in industrial plants, particularly on machines that move or change positions. This gear serves as a gear for engine components, it moves or changes position when the engine component does.

ARDUINO



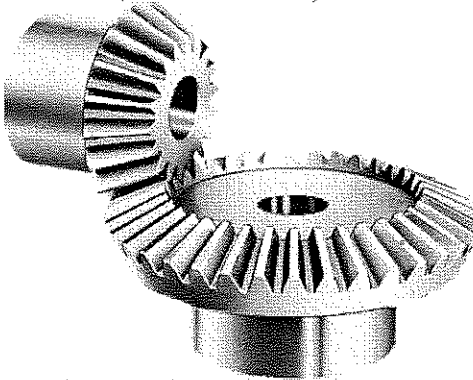
Arduino is an open-source hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices.

DC 24V 250 WATT MOTOR



Geared and powered a 250 Watt motor will move a gokart at modest speed.

PINION (BEVEL GEAR)



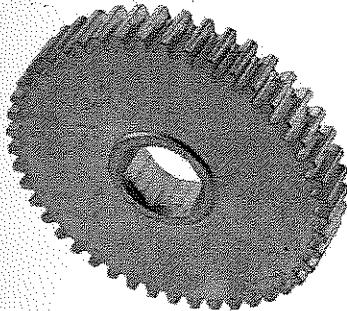
The pinion gear connects to the steering shaft so that the gear will spin and move the rack when the steering wheel turns.

12V 7.2AH BATTERY



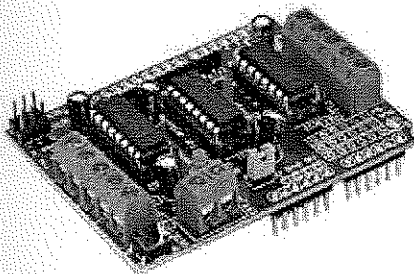
A battery uses one or more cells to allow a chemical reaction creating the flow of electrons in a circuit.

TEETH GEAR 1,2,3,4,5&6



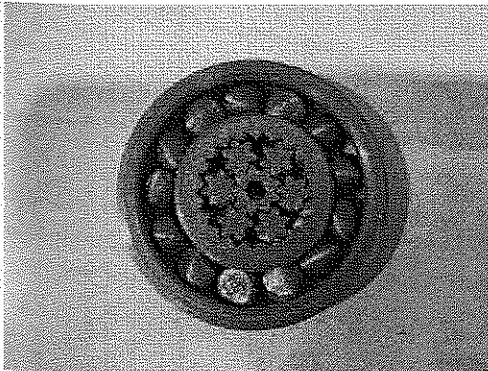
A gear is a rotating circular machine part having cut teeth which mesh with another (compatible) toothed part to transmit (convert) torque and speed.

MOTOR DRIVER



The Arduino Motor Shield is based on the L298 (datasheet), which is a dual full-bridge driver designed to drive inductive loads such as relays, solenoids, DC and stepping motors. It lets you drive two DC motors with your Arduino board, controlling the speed and direction of each one independently.

BEARING



Bearings are parts that assist objects rotation. They support the shaft that rotates inside the machinery.