Topic Name: **"Blooms Taxonomy-Ways to learn Engineering (Civil)"**

- To estimate the cost of industrial building
- Quantity surveying is concerned with controlling and managing the construction projects.

Objective:

- To aware the students about the skill of estimation and coasting.
- To develop the consultancy etiquette.
- To relate the application of mathematics in civil engineering field.
- To grow engineering learning domains amongst students – **from Understanding to Creativity**

Activity:

Duration: 1/2 Day [3 Hours]

- Students have to visit the civil engineering department and observe the different components of building. Students have to remember all the component of the building. [Facilitator will guide students to **explain** the importance of various components.]
- Students will be given a questionnaire to solve based on **remembering** and **understanding** of previous discussion
- Each group has to allot different room of civil department (Block G) for estimating and costing.
- Students have to identify different components of that room like doors, windows, beam, column etc.
- Students have to measure the length, width, height of room, nos. of column, beam, size of doors and windows(as per the given quantity sheet)(here students will applying their mathematical knowledge)

- Students have to fill quantity sheet as per the given components.
- Now facilitator will provide chart of material required for one m^3 of construction for brick work and R.C.C. work Rates will be given as per the S.O.R. of RMC.
- By using this chart students will get quantity of materials like cement, sand, water, aggregate, paints, wood etc.
- For creativity purpose students have to draw one small plan of residential building and have to find the quantity of different materials and total cost of construction of that plan.
- They have to implement the knowledge of various building components and materials for the given task

References:

[1] www.rmc.gov.in

[2] A book of " Estimate and costing in civil Engineering" by B.N. Dutta

[3] http://theconstructor.org/practical-guide/rate-analysis-for-reinforced-concrete/6954/

Outcome:

- To be able to value any type of building.
- To be able to apply knowledge of mathematics in civil engineering.
- To be have confident consultancy field.
- Development of **Cognitive** (*knowledge*) and **Psychomotor** *(Manual skills)* domain amongst students.
- To determine if it is a sound investment/decision (justification/feasibility)

Requirements:

1) **List of Equipment:**

Quantity sheet, Drawing sheet, Pencil, eraser, scale, measuring tape, calculator (one for each group)

2) **Number of students per batch :** 20 to 25

3) **No. of students in one group:** Minimum 5

RATE ANALYSIS FOR 1 M3 BRICK WORK					
Sr. No.	**MATERIALS**	**QUANTITY**	**UNIT**	**RATE PER UNIT**	**AMOUNT**
1	BRICK	500	NOS.	1200 (PER 500 BRICKS)	
2	SAND	1.14	CUMT.	720	
3	CEMENT	5.5	BAGS	336	
TOTAL					
4	MASON	2	HEAD/ DAY	450	
6	LABOUR	1	HEAD/ DAY	300	
TOTAL					
8	1.5 % WATER CHARGES				
9	3% CONTIGENCIES				
10	10% PROFIT				
11	**GRAND TOTAL**				

Topic Name: **"Blooms Taxonomy-Ways to learn Engineering (Mechanical)"**

To prepare best things from waste material like "Build the longest chain that will hold the most weight" and "Balloon car".

Objective:

- To fit newton's law with day to day life application, creating longest chain and balloon car using critical thinking methods.
- To make students learn through an extracurricular activity with exclusive tool i.e. waste material.
- To grow engineering learning domains amongst students – from Understanding to creativity

Activity:

Activity 1: Duration: 1 day (6 Hrs.)

Build the longest chain that will hold the most weight:

- Introduction of chain mechanism. [Facilitator can clearly mention learning domain: **Remembering** by drawing different chain mechanisms.]
- Working model presentation and application of chain mechanism. [Facilitator will guide students to **observe** and **infer** the application concept and to **identify** the components used for chain mechanism. Facilitator can introduce learning domains: **Remembering**, **Understanding**, **Applying** and **Creating** regarding the application development]
- Dividing students in a group to perform given task. [Minimum of 3 students and Maximum 4 students per group according to number of students per batch]
- Students will be directed to draw **[Analyzing and Applying]** the chain mechanism. [Facilitator can **clarify** to students that they have passed through learning domains: **Applying and Analysing** after completing this exercise]
- Team of students will be provided with a junk box filled with materials to build a chain.

- Observing **[Analyzing, Evaluating]** different possibilities for making a chain. [Facilitator can **clarify** to students that they have passed through learning domains: **Evaluating and Analysing** after completing this exercise.]
- Implement **[Applying]** the different chain mechanism to build a longest chain **[Creating]**. [Facilitator can explain students about **Design Exercise** importance and **practical implementation** of their designs in building Higher Order Thinking Skills like **Applying, Evaluating** and **Creating**]

Procedure:

- Students of the team must hold onto each end of the chain during testing and cannot provide additional support to any other part of the chain.
- Students of the team will be required to select five different anchor points for each of the weights prior to the testing process.

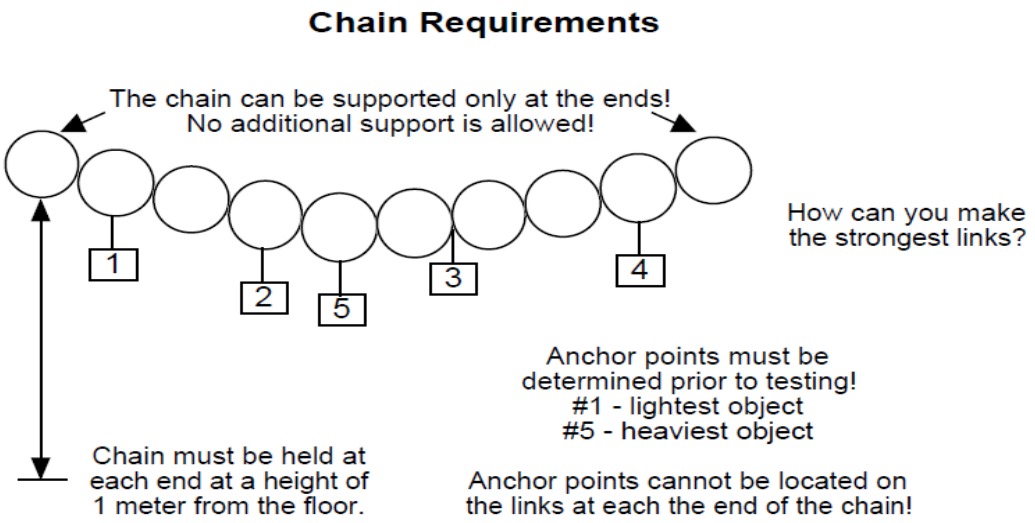

Figure 1 Procedure of making chain[1]

- Anchor points cannot be located on the links at each end of the chain and cannot be adjusted during the testing process after the first weight is attached.
- Testing will begin with the lightest object. If that object is held successfully, the remaining objects will be added following the same procedure - lightest to heaviest.
- Testing will be done when the chain or testing weight touches the floor, the chain breaks apart, or the chain holds all the weights.

Activity 2: Duration: 1 day (6 Hrs.)

Balloon car Which runs on newton's third law

- Introduction of Newton's third law. [Facilitator can clearly mention learning domain: **Remembering** by definition and examples which obey newton's third law.]
- Working model presentation and application of newton's third law.
- Dividing students in a group to perform given task.[Minimum of 3 students and Maximum 4 students per group according to number of students per batch]
- Students are allowed to draw **[Analyzing and Applying]** a balloon car which runs on newton's third law. [Facilitator can **clarify** to students that they have passed through learning domains: **Applying and Analysing** after completing this exercise.]
- Team of students will be provided with a junk box filled with materials to build a balloon car.
- Observing **[Analyzing, Evaluating]** different possibilities for making a balloon car. [Facilitator can **clarify** to students that they have passed through learning domains: **Evaluating and Analysing** after completing this exercise.]
- Implement **[Applying]** the different mechanism to make a balloon car **[Creating]**. [Facilitator can explain students about **Design Example** importance and **practical implementation** of their designs in building Higher Order Thinking Skills like **Applying, Evaluating** and **Creating**]

Procedure:

- Put the one end of a straw into a balloon.
- Fasten the straw and balloon so that no air can escape, using rubber band.
- Punch two holes in the bottle's sides, on the part of the bottle that will be the bottom of the car.
- Make the holes directly across from each other so the axle goes straight across, Slide a straw through the two holes
- Make a wheel and insert it in to car.
- Blow up the balloon by blowing through the straw.

References:

[1] http://school.discoveryeducation.com/networks/junkyardwars/pdf/junkboxchains.pdf

[2] http://www-tc.pbskids.org/designsquad/pdf/parentseducators/4wheelcar-english.pdf

[3] https://www.tes.co.uk/teaching-resource/balloon-car-racers-6439720

Outcome:

- The students will be able to make useful application for society with the help of waste material.
- Students will be able to learn how to apply Engineering Laws in real world as by making an application from Newton's Law for Mechanical Engineering.
- Students will be motivated to work on chain mechanism and balloon car which in turn will be helpful to create interest in mechanical subjects in future.
- Development of **Cognitive** (*knowledge*) and **Psychomotor** *(Manual skills)* domain amongst students.
- Development of team work and management skills amongst students (**Affective** Domain).

The students would be judge at the end of activity based on following parameters.

Activity 1:

Build the longest chain that will hold the most weight:

Make a chain = 5 points

Length of Chain = _____ cm (1 cm = 1 point)

Weights
#1 – 2 points #2 – 4 points #3 – 6 points #4 – 8 points #5 – 10 points

Total score = Length score + Weight score = _____

Activity 2:

Balloon car

Make a balloon car = 5 Points

Distance cover by Car _____ M (1 M = 10 Points)

Requirements:

1. List of Material

Activity 1:

Build the longest chain that will hold the most weight:

We have to provide material to each group of students as given below:

1. 10 Straws
2. 10 Wooden Craft Sticks
3. 20 Index Cards (3 x 5)
4. 10 Pieces of Paper (8 1/2" x 11")
5. 200 cm of String or Thread
6. 200 cm of Masking Tape
7. 10 Pipe Cleaners
8. 10 Rubber Bands
9. 2 CDs

Miscellaneous material (Common for all groups)

1. Cutter
2. Scissors
3. Hammer
4. Fevicol
5. Anchors

Activity 2:

Balloon car

We have to provide material to each group of students as given below:

1. 1 Balloon
2. 1 Flexible straw
3. Rubber band or tape
4. 4 Bottle caps / CDs
5. 1 water bottle / juice can/ cardboard sheet
6. 4 straws/chopsticks
7. Clay/ dry sponge

Miscellaneous material (Common for all groups)

1. Cutter
2. Scissors
3. Hammer
4. Fevicol
5. Measure tap

2. Number of students per batch : 25 to 30

3. No. of students in one group: 3 to 4

Topic Name: **"Blooms Taxonomy-Ways to learn Engineering (Electrical and Electronics)"**

- To Design Temperature Indicator and Light Indicator through "Voltage divider" and "Transistor as a switch" concepts.

Objective:

- To **understand** and **apply** voltage divider rule concept to design a temperature and light detection circuit
- To introduce lower order thinking skills and higher order thinking skills and make students learn engineering concepts through learning by doing
- To grow engineering learning domains amongst students – **from Understanding to Creativity**

Activity:

Duration: 1 Day [6 Hours] up to 2 days [12 Hours]

- Working model **presentation** of Application: Temperature controller using Thermistor and transistor as a switch [Facilitator will guide students to **observe** and **infer** the application concept and to **identify** the components used in the circuit. Facilitator can introduce learning domains: **Remembering**, **Understanding**, **Applying** and **Creating** regarding the application development]
- Introduction of Bread Board, Multimeter (Continuity function) and basic electronics components [Facilitator can clearly mention learning domain: **Remembering** by drawing symbols of Basic circuit components like resistor, transistor etc.]
- Students will be given a questionnaire to solve based on **remembering** and **understanding** of previous theory concepts of 12^{th} standard.
- Dividing students in groups to perform various tasks [Minimum of 3 students and Maximum 4 students per group according to number of students per batch]
- **Drawing [Analyzing and Applying]** of connection diagram of bread board and **calculation [Evaluating]** of value of carbon resistors from color code and **comparing [Evaluating]** practical and theoretical values of resistors. [Facilitator can

clarify to students that they have passed through learning domains: **Applying, Analysing, and Evaluating** after completing this exercise]

- **Observing[Analyzing]** different resistance values of potentiometer and presets using Multimeter
- **Understand** the concept of "voltage divider network"
- **Implementation [Applying]** and **Observation [Analysis]** of voltage divider network with the use of Multimeter, power supply, one fix value of resistor and variable resistor
- **Calculation of Design examples [Understanding, Applying and Creating]** based on finding required value of resistor by **applying** "voltage divider concept". **Implement** practically and **compare** theoretical and practical results. [Facilitator can explain students about **Design Example** importance and **practical implementation** of their designs in building Higher Order Thinking Skills like **Applying, Evaluating** and **Creating**]
- **Understanding** Temperature sensor (Thermistor) and Light sensor (Light dependent resistor)
- **Implement** circuit on bread board for (1) "voltage divider network" consists of Thermistor (2) "voltage divider network" consists of Light dependent resistor. **Observe** and **analyze** change in resistance values and voltage drop across Thermistor/Light dependent resistor with change in temperature/light intensity accordingly.
- **Understand** the concept of "Transistor as a switch", equations, **design** examples and **implementation** on bread board.
- Group of students will be provided different sensors [light, temperature etc.] and required components to initiate creativity amongst them. Students can then start designing their application on paper as well as practically.
- **Designing** the circuit diagram of temperature/light detection circuit by **finding** the values of resistors in "voltage divider circuit" and transistor circuit.
- **Implement** the circuit on breadboard and run the application by providing heat/light to Thermistor / LDR accordingly. [Facilitator can emphasize how they have started with **understanding** and completed the circuit with **creativity**]
- **Video making** of the steps of circuit designing and working application.

References:

[1] http://www.electronics-tutorials.ws/transistor/tran_4.html

[2] http://www.sophphx.caltech.edu/Physics_5/Experiment_6.pdf

[3] Integrated Electronics By Jacob Millman and Christos C. Halkias, Tata McGraw Hill Publication

[4] Electronic Devices and Circuit Theory by Robert Boylestad and Louis Nashelsky [Ninth Edition]

Outcome:

- Students will be able to design sensor based circuits using "Voltage divider" and "Transistor as a switch" concepts
- Students will learn about designing steps of small electronic circuits and applications.
- Students will be motivated to work with electronic circuits which in turn will be helpful to create interest in electrical and electronics subjects in future.
- Development of **Cognitive** (*knowledge*) and **Psychomotor** *(Manual skills)* domain amongst students

Requirements:

4) List of Equipments:

- NPN Transistors : BC547/BC548

- Different values of resistors [Students can be provided all of the following values of resistors from which students can select different values of resistors as per design calculations of different applications (like Temperature detector, Light detector, short circuit detector or Water level detector etc.) :

47Ω, 100Ω, 330Ω, 470Ω , 500Ω, 1KΩ, 2.2KΩ, 3.3KΩ, , 4.7KΩ, 10KΩ, 22KΩ, 33KΩ, 47KΩ, 100KΩ , 220KΩ, 330KΩ, 470KΩ, 1MΩ

- Variable Resistors : 1KΩ, 5KΩ, 10KΩ, 50 KΩ, 100kΩ, 1MΩ
- Thermistor: TH 100KΩ/TH 110Ω/TH 4.7KΩ NTC
- LDR/PIR Sensor Module/Piezoelectric Sensor
- D.C. Battery or Power supply : 9V or 12V
- LED : Red
- Electronic Buzzer : 3 to 12V
- Bread Board
- Multimeter
- Soldering kit and general purpose PCB (optional)

5) Number of students per batch : 25 to 30

6) No. of students in one group: 3 to 4