Gujarat Technological University

-: Draft Syllabus :-

Bachelor of Engineering - BRIDGE COURSE

Duration: 4 Weeks (Academic Year: 2015-16)

Objective of Bridge Course:

The Bridge Course is aimed to act as a buffer for the new entrants, with an objective to provide adequate time for the transition to hard-core engineering courses.

During this interaction of 4 weeks with the faculty and their classmates, the students will be equipped with the knowledge and the confidence needed to take on bigger challenges as future engineers of this country. .

Bridge Course Planning

Four Major Activities

Sr. No	Particulars	Number of Days	Points	Page No.
1	Village Visit a. Day 1: 1. Create a helping attitude 2. Interact with people and observe their way of living. 3. Compare with own lifestyle 4. Make a list – what they have, do not have and what they can BETTER have. b. Day 2: 1. Interact more to get further details on one of the betterment you wish to bring 2. Group yourself as per the problem you wish to solve/ betterment you wish to bring. 3. Group size <=4 c. Day 3: 1. Discuss internally In the group about individual ideas	06	02	01

	2. Check for technical feasibility and resource availability. d. Day 4: 1. Play games with them and help in their work 2. Experience a day without facilities and leisure e. Day 5: 1. Discuss about their expectations and dreams of development in deep 2. Arrange a basic awareness session on how to solve/overcome basic problems they face daily. It could include awareness about government facilities availed for their betterment. f. Day 6: 1. Make an easy move back so that you can contact anytime further you need. Have a fun day 2. Decide the time and purpose for which you could go back to help **The problems students identify should be further analysed and developed during their subsequent visit until completion of their Graduation.**			
02	Learning Engineering a. Technical Movies—1 Days b. Learning Engineering-Bloom's taxonomy – Creating awareness about the learning domain – 3 days c. Study of Technical Disaster and Innovation-Presentation- 3 Days- Group work-development of Collaborative problem solving skill	07	02	03
03	History of Science & Technology	05	02	21
04	Life Skill a. College will give greater importance to yoga	06	02	53
05	Evaluation Report Sheet			60

Learning Engineering

Topic Name: **"Tech Movies – Ice Breaking"**

- To shift learning attitude of students from rote learning to analyzing, evaluating and creativity

Objective:

- To provide the bridge between current learning attitude to engineering learning attitude
- To introduce Bloom's learning domains: **analyzing, evaluating** and **creativity** through tech movies
- Students should understand and apply **Bloom's Taxonomy** (**Lower Order Thinking Skills to Higher Order Thinking Skills**) in Engineering learning

Activity:

1 Days [1 movies]

"An eye is powerful than an ear" (Sherman, 2003).

1. Watching I-Robot Movie (Or any other Technical movie)
2. Question-Answer in middle part of the movie

- Making of groups of students
- Individual Questions to group of students

[**Example:** Question for **I-Robot** Movie:

(1) What safety and insurance regulations are necessary for Robot? Explain and Discuss.

(2) If a robot causes harm due to a malfunction or a wrong decision taken autonomously who is to take the blame and be made to bear the consequences, such as

Legal liability? Is it the owner, or the designer, or the seller or all three? Justify your Answer.]

- Discussion and summarization of answers

[Facilitator can explain students what is the purpose to show movie and the way they have started learning. As to answer movie questions students has to observe, analyze, evaluate, predict and present their ideas and thoughts. They will be applying Higher order thinking skills throughout the activity]

3. Completion of rest of the part of movie by giving questions prior to the part of movie
4. Introducing Higher order thinking skills : **Analyzing** (**Judging, reviewing, testing, defending**) and **Evaluating** (**Comparing, Organizing, Connecting, Examining**)
5. Discussion and summarization of answers on 2nd day
6. Same process for another tech movie with different and interesting questions on 2nd day

References:

[1] Padmini Sathyanarayanan and Sheenu Shekhar (2013), "Teaching Vocabulary to Engineering Students through Movies", Indian Journal of Applied Research

[2] Berk, R. A. (2009), "Multimedia teaching with video clips: TV, movies, YouTube, and mtvU in the college classroom". International Journal of Technology in Teaching and Learning

[3] Thomas A. Angelo/K. Patricia Cross, Classroom Assessment Techniques 2nd Edition. Jossey-Bass: San Francisco, 1993.

[4] Alison Morrison-Shetlar/Mary Marwitz, Teaching Creatively: Ideas in Action. Outernet: Eden Prairie, 2001.

[5] Silberman, Mel. Active Learning: 101 Strategies to Teach Any Subject. Allyn and Bacon: Boston, 1996.

[6] VanGundy, Arthur. 101 Activities for Teaching Creativity and Problem Solving. Pfeiffer: San Francisco, 2005.

Website : *http://www.nwlink.com/~donclark/hrd/bloom.html*

Outcome:

- Students will be able to start changing their perspective of learning by introducing Higher order thinking skills like: Analyzing and Evaluating
- Development of **Affective domain** *(feelings or emotional areas)* and **Psychomotor** *(Manual skills)* domain amongst students.

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.

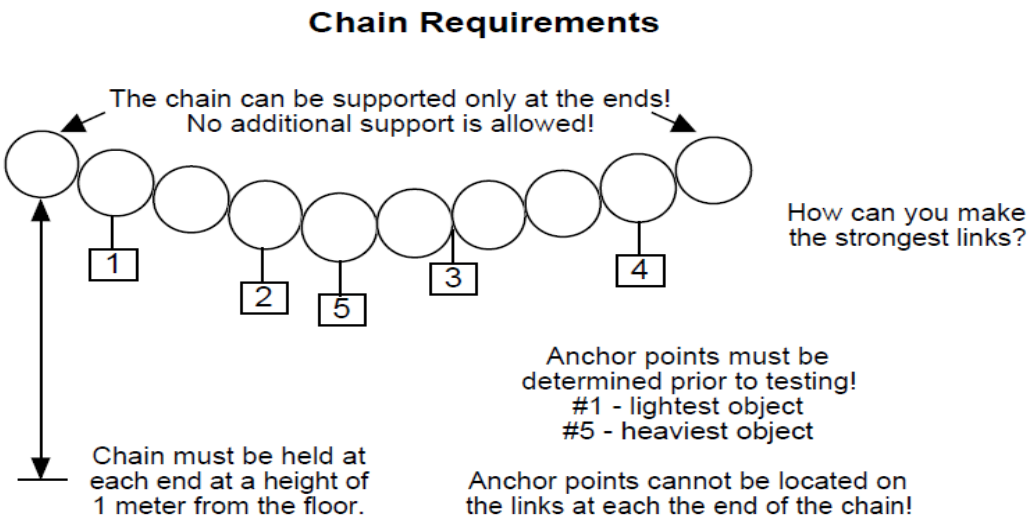


Figure 1 Procedure of making chain[1]

- 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 equipment:

- 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

Topic Name: **"Presentation on Technical Disaster or Innovation"**

- Presentation on Technical Disaster or Innovation

Objective:

- To shift learning attitude of students from rote learning to understanding, analyzing designing and creating
- To prepare a presentation on any one Technical Disaster or Innovation with which some technical concepts, knowledge and information can be concluded
- To develop soft skills like self-learning, group behavior, group ethics, management skills and presentation skills as well as technical skills amongst students
- Students will understand and apply **Bloom's Taxonomy** (**Lower Order Thinking Skills to Higher Order Thinking Skills**) in Engineering learning

Activity:

Total Days: 03

1st Day:

- Presentation of one Technical innovation and one Technical disaster to the students
- Providing steps to make the presentation
- Making of group of students[10 to 12 students per group] and allotment of topics (students can also search and decide the topic of presentation)
- Start gathering the information about the topic i.e. pdf documents, research papers, information on internet, videos, audios, animation etc.

2nd Day:

- Students should discuss in group, divide the given work, gather information, understand the concept and prepare presentation in the provided structure

3rd Day:

- Preparation of the presentation for half day

- Presentation by all the students of group in the provided structure of presentation

References:

[1] Robert J Niewoehner, Captain, U.S. Navy, Ph.D., Craig E. Steidle, Rear Admiral, U.S. Navy (ret.), U.S. Naval Academy**, "**The Loss of the Space Shuttle Columbia: Portaging Leadership Lessons with a Critical Thinking Model"

[2] Tufte, Edward R. *Visual Explanations*, (Graphics Press: Cheshire CT, 1997), pg. 45ff.

[3] http://www.inventor-strategies.com/latest-science-inventions.html

Outcome:

- Students will have knowledge and skill to represent technical concepts which will help them in future technical presentations including Seminar, Active Learning Assignments, Project presentation etc.
- Students will be able to start changing their perspective of learning by introducing Higher order thinking skills like: Analyzing and Evaluating
- Development of soft skills like self-learning, group behavior, group ethics, management skills and presentation skills as well as technical skills amongst students
- Development of **Cognitive** (*knowledge,* **Affective** *(feelings or emotional areas))* and **Psychomotor** *(Manual skills)* domain amongst students.

Topics for reference:

Topics for Invention:

1. Sterilizing Spray
2. Three Dimensional Printing
3. Glass Nanobots Absorb Toxins
4. Water Drop Lens
5. Batteries That Operate With Any Liquid
6. 3D Printed Car
7. Car Gps Tracking
8. Air Into Water
9. Vein Identification
10. World's Fastest Motor

11. A House that Walks
12. Transparent Smartphones
13. Hollow Flashlight
14. Smart box Technology
15. Electronic Pills - Collecting Data Inside The Body
16. Digital Pen
17. Instant Prints
18. Clean Water
19. Recycling Paper
20. Vertical Farming
21. Bionic Eye
22. Nano-Tube - Hair-Thin Loudspeakers
23. Solar Foil
24. Flying Robots
25. Military Robots
26. Nano Hummingbird

Topics for Disasters:

1. The Vasa sinking
2. The Hyatt Regency walkway collapse
3. The Eschede train derailment
4. The 1965 Northeast blackout
5. Patriot Missile Failure (due to calculation error from processor)
6. Tacoma Narrow Bridge Failure (due to wrong design)
7. Concorde 203 F BTSC crash (due to blow out of tire)
8. R101 Airship Disaster (due to fire)
9. Failure of Soviet Moon Rocket (due to some small mistakes)
10. Air India Express flight 812 Crash
11. Chrnobyl Disaster
12. Columbia Space Shuttle Disaster
13. Wenzhou Train Collision
14. Machhu dam Disaster.
15. Failure of mars climate orbiter (due to wrong unit conversion system)
16. US safety board determines DC Metro crash (due to failure of track circuits and safety culture
17. Aloha Airlines Flight 243 (due to the quality of inspection and maintenance programs were deficient.)
18. Fukushima nuclear power plant disaster (due to lack of governance)

19. Titanic disaster (due to design compromisation for better facilities and aesthetic look)
20. The Banqiao Reservoir Dam Failure (due to low standard construction & lack of communication of higher authorities)
21. The Space Shuttle Challenger (due to o rings failure and ignored by the engineers)
22. Surat flood 2006
23. Northern Grid disturbance on 30July 2012 (Due to disobeying of order by SLDC)
24. Flixborough Disaster on 1st June 1974
25. Uttarakhand disaster 2013
26. Gulf of Mexico oil spill 2010
27. Three Mile Island accident (March 28, 1979)
28. Sayano–Shushenskaya power station accident (August 17, 2009)
29. K-141 Kursk submarine Disaster of the Russian Navy (nuclear-powered cruise missile self-explosion due to leakage of hydrogen peroxide)
30. Mars Pathfinder Priority Inversion problem: 1 day Delay in Mission (1997)
31. Y2K(Year 2000 Computer Problem) Problem
32. The Iroquois Theater Blaze - 1903 (Due to improper safety measures)
33. The Airbus saga: Crossed wires and a multibillion-euro delay - 2006 (Due to incompatible software issues)
34. Texas City Refinery Explosion - 2005 (Due to numerous failings in equipment and operator error)
35. DC - 10 Crash 1970's (Due to aviation faulty maintenance measures)
36. Piper Alpha Oil Rig Disaster - 1988 (Due to lapses in safety inspection and procedures)
37. 2006 Kolkata Leather Factory Fire
38. 2011 Nairobi Pipe Line Fire
39. Costa Concordia Disaster
40. Minamata Chisso Disaster
41. De la Concorde Overpass Collapse
42. The explosion of the Ariane 5 (1996)
43. The Ashtabula Creek Bridge wreck
44. Mariner Bugs Out (1962)
45. The Bhopal Disaster

"History of Science & Technology"

INDEX

Topic Name:

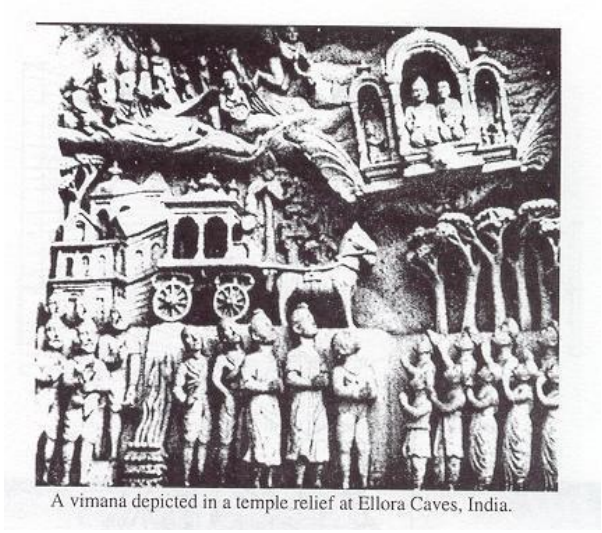
To prepare paper airplane

Objective:

To prepare paper airplane and demonstrate the functioning.

Activity:

The dream of flying is as old as mankind itself. However, the concept of the airplane has only been around for two centuries. Before that time, men and women tried to navigate the air by imitating the birds. They built wings to strap onto their arm or machines with flapping wings called ornithopters. On the surface, it seemed like a good plan. After all, there are plenty of birds in the air to show that the concept does work. Many stories from antiquity involve flight, such as the Greek legend of Icarus and Daedalus, and the Vimana in ancient Indian epics. The *Yujurveda* quite clearly tells of a flying machine, which was used by the *Asvins* (two heavenly twins). The *Vimana* is simply a synonym for flying machine. It occurs in the Yajurveda, the Ramayana, the Mahabharata, the Bhagavata Purana, as well as in classical Indian literature. At least 20 passages in the *Rig Veda* (1028 hymns to the gods) refer exclusively to the flying vehicle of the *Asvins*. This flying machine is represented as three-storeyed, triangular and three –wheeled. It could carry at least three passengers. According to tradition the machine was made of gold, silver and iron, and had two wings. With this flying machine the *Asvins* saved King Bhujyu who was in distress at sea.



A vimana depicted in a temple relief at Ellora Caves, India.

In the Yantra Sarvasva, sage Maharshi Bhardwaj describes vimana, or aerial aircrafts, as being of three classes:

1. Those that travel from place to place;
2. Those that travel from one country to another;
3. Those that travel between planets.

Before starting the activity watch this video:

Ancient Flying Vimana Recreated - Shivkar Bapuji Talpade [7]

Steps of Activity :

1. Take a sheet of paper and form a group of students.

2. Fold in Half: Fold a sheet of paper in half down the center and then open it up again so that it lays flat.

3. Fold the Cockpit: Fold the cockpit so that the flap corners meet at the center line.

4. Fold the Cockpit Down: Fold the cockpit down so that the point lines up with the center fold line.

5. Fold the 2nd Cockpit: Fold second cockpit by folding tow flaps down like the 3rd step.

6. Make the First Folds of the Wings: Fold another two flaps down to the center of the plane.

7. The Second Folds of the Wings: Flip the plane over and fold each side in to line up with the center fold of the plane.

8. Ready For Takeoff: Flip the plane over one last time and open up the folds so that you have the 'body' of the plane to hold on to . Now ready for a test flight. To fly well, fly inside and throw as hard as you can.

9. Result: Measure the distance and time of flight for each group.

References:

[1]*https://en.wikipedia.org/wiki/Airplane*

[2]*http://www.wrightbrothers.org/History_Wing/History_of_the_Airplane/History_of_the_Airplane_Intro/History_of_the_Airplane_Intro.htm*

[3]*http://www.wikihow.com/Make-a-Paper-Airplane*

[4]*http://www.instructables.com/id/how-to-make-the-fastest-paper-airplane/*

[5]*http://www.foldnfly.com/index.html#/1-1-1-1-1-1-1-1-2*

[6]*http://www.bibliotecapleyades.net/vimanas/esp_vimanas_4.htm*

[7] *https://www.youtube.com/watch?v=UNt_Ye51WDk*

Outcome:

The students would be able to understand the basic principle of flying. The effect of force acting on it.

Topic Name:

Gyroscope

Objective:

To understand and demonstrate the working principle of gyroscope

Activity:

As mention in “The Vimanka Sastra”, the Rukma Vimana is self-propelled, its main energy source being a gyroscope mechanism within the main body of the Vimana itself. The gyroscope’s outer ring would be filled with mercury and have an electrical current run through it. Because the mercury is liquid, it can circulate around the body of the Vimana and would also act as a rotating electromagnet due to mercury’s conductive properties. This is theorized to cause anti-gravity-like effects as well as a “glowing light” [1].

In early times, people discovered the spinning top, a toy with a unique ability to balance upright while rotating rapidly. Ancient Greek, Chinese and Roman societies built tops for games and entertainment.

The Maori in New Zealand have used humming tops, with specially-crafted holes, in mourning ceremonies. In 14th century England, some villages had a large top constructed for a warming-up exercise in cold weather. Tops were even used in place of dice, like the die in the contemporary fantasy game Dungeons & Dragons.

It was not until the late 18th and early 19th centuries that scientists and sailors began attempting to use spinning tops as a scientific tool.

In the first several decades of the 20th century, other inventors attempted (unsuccessfully) to use gyroscopes as the basis for early black box navigational systems by creating a stable platform from which accurate acceleration measurements could be performed (in order to bypass the need for star sightings to calculate position). Similar principles were later employed in the development of inertial navigation systems for ballistic missiles.

Material requirements:

1. Wheel
2. Stand to mount the wheel
3. String

Procedure:

1. Prepare a group of students and provide material.
2. Guide the students to mount wheel first on stand. The wheel should be in position to rotate either clockwise or anticlockwise.
3. Use the provided the string to suspend the wheel after providing rotating motion.
4. Apply force to rotate the wheel.
5. Ask students to observe and note the difference in oscillation of wheel in both the case of rotation.

References:

[1] Shastry, Subbaraya; Josyer, G. R. (1973). *Vymaanika Shaastra* - Aeronautics by Maharshi Bharadwaaja. Mysore: Coronation Press.

[2] *http://solarsystem.nasa.gov/scitech/display.cfm?ST_ID=327*

[3] *https://en.wikipedia.org/wiki/Gyroscope#History*

[4] *https://www.youtube.com/watch?v=zbdrqpXb-fY*

[5] *https://www.youtube.com/watch?v=cquvA_IpEsA*

Outcome:

The students would be able to understand the basic principle of gyroscope. The effect of force acting on it.

Topic Name:

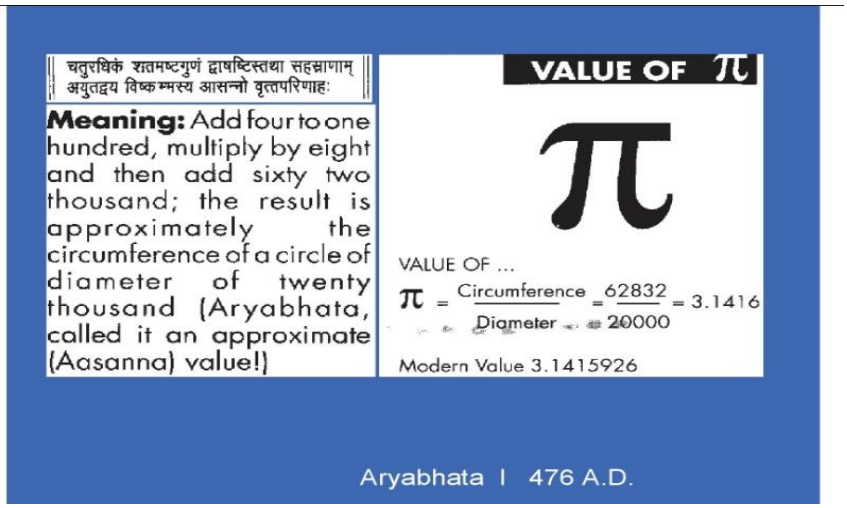
Finding the value of π (Pi)

Objective:

To understand the important of π, with a brief history of its finding

Activity:

There is one Hidden truth of value of π.More than 4700 years ago, the famous Indian mathematician and astronomer Aryabhatta (476 A.D.) gave 62832/20000 = 31416/10000 = 3.1416 as an approximation of π(written in second part of the Aryabhatiyam).

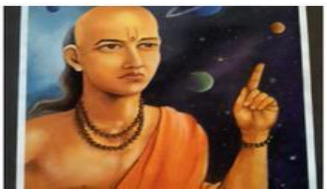


Aryabhata worked on the approximation for **pi** and have come to the conclusion that Pi is **irrational**.

In the second part of the Aryabhatiyam (gaṇitapāda 10), he writes:
|| caturadhikam śatamaṣṭaguṇam dvāṣaṣṭistathā sahasrāṇām
ayutadvayaviṣkambhasyāsanno vṛttapariṇāhaḥ.||

"Add four to 100, multiply by eight, and then add 62,000. By this rule the circumference of a circle with a diameter of 20,000 can be approached."

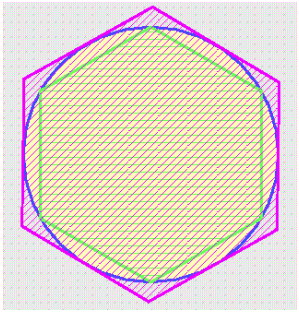
This implies that the ratio of the circumference to the diameter is ((4 + 100) × 8 + 62000)/20000 = 62832/20000 = **3.1416**, which is accurate to five significant figures.



The ancient Babylonians generally calculated the area of a circle by taking 3 times the square of its radius (π=3), but one Old Babylonian tablet (from ca. 1900-1680 BCE) indicates a value of π is 3.125.Ancient Egyptians calculated the area of a circle by the following formula (where d is the diameter of the circle):

$[(8d)/9]^2$ This way an approximate value of π is 3.1605.

But, The first theoretical calculation of a value of π was proved by Archimedes of Syracuse (287-212 BCE), one of the most brilliant mathematicians of the ancient world. Archimedes worked out that $223/71 < \pi < 22/7$. Archimedes' results rested upon approximating the area of a circle based on the area of a regular polygon inscribed within the circle and the area of a regular polygon within which the circle was circumscribed.



Beginning with a hexagon, he worked all the way up to a polygon with 96 sides!

Materials:

- Thread
- Unit Scale [Students have to define their own unit scale]
- Scissors
- Marker pen

Producer:

1. First of all take a long thread.
2. Cut thread into number of pieces with help of scissors (cutter).
3. Now draw the circle on the floor with help of marker pen and put thread pieces onto the circle marked line in a proper way.
4. Now you calculate the circumference of circle with help of formula of
5. Circumference = 2πr
6. Where D is longest chord of circle, r is radius of circle
7. Repeat this for different circle.

References:

[1] Website :*https://en.wikipedia.org/?title=Pi*

[2] Website :*http://www.math.com/tables/constants/pi.htm*

[3] Website :*http://www.projectmathematics.com/storypi.htm*

[4] Video: *https://www.youtube.com/watch?v=_IOcWcatWFY*

[5] Video: *https://www.youtube.com/watch?v=LLuAhTcZLpU*

Outcome:

We know that **π** is closely related to the circle, it is used in many formulas from the fields of geometry and trigonometry, particularly those concerning circles, spheres, or ellipses. And Formula from other branches of science & engineering include **π** in some of their important formulae, including sciences such as statistics, fractals, thermodynamics, mechanics, cosmology, number theory, and electromagnetism etc.

Topic Name:

Pythagoras theorem

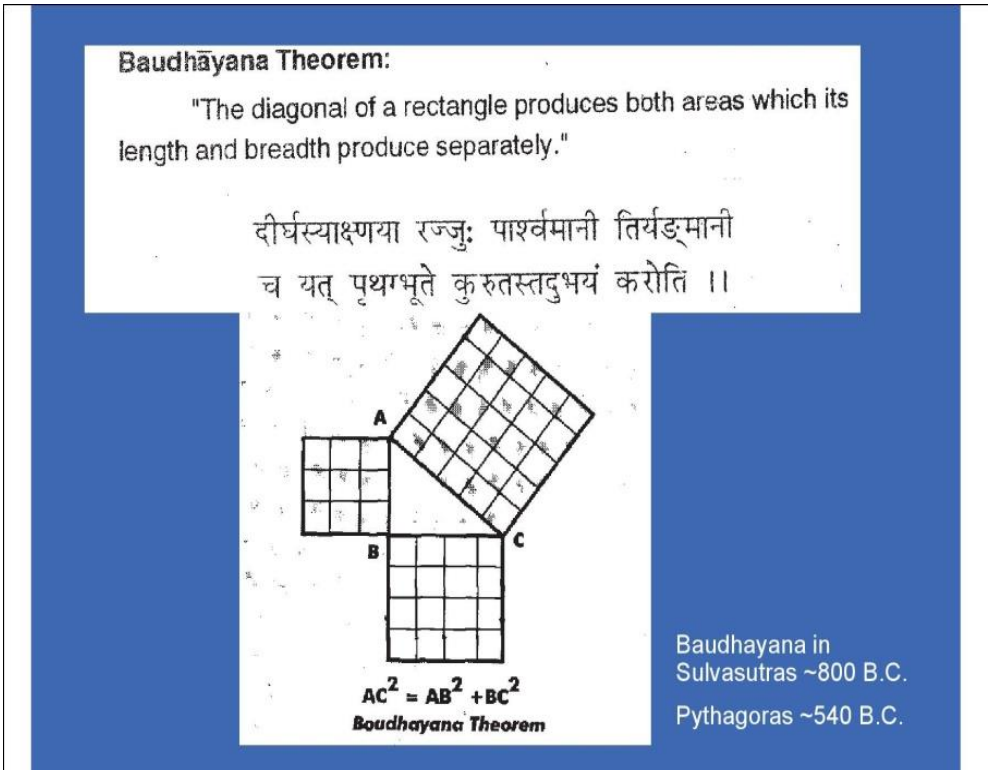
Objective:

Students will understand the importance of Pythagoras theorem in Engineering and Science.

Activity:

History of Pythagoras Theorem:

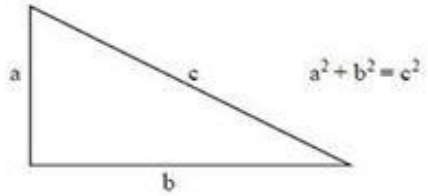
Indian Mathematician Baudhayana, had given a precise geometric expression of "Pythagorean theorem" mentioned in his book Shulbasutra, which is considered to be the first book on advanced mathematics.



It was Baudhāyana who discovered the Pythagoras theorem. Baudhāyana listed Pythagoras theorem in his book called Baudhāyana Śulbasûtra (800 BCE). Incidentally, Baudhāyana Śulbasûtra is also one of the oldest books on advanced Mathematics. The actual shloka (verse) in Baudhāyana Śulbasûtra that describes Pythagoras theorem is given below:

दीर्घचतुरश्रस्याक्ष्णया रज्जुः पार्श्वमानी तिर्यग् मानी च यत् पृथग् भूते
कुरुतस्तदुभयं करोति ॥

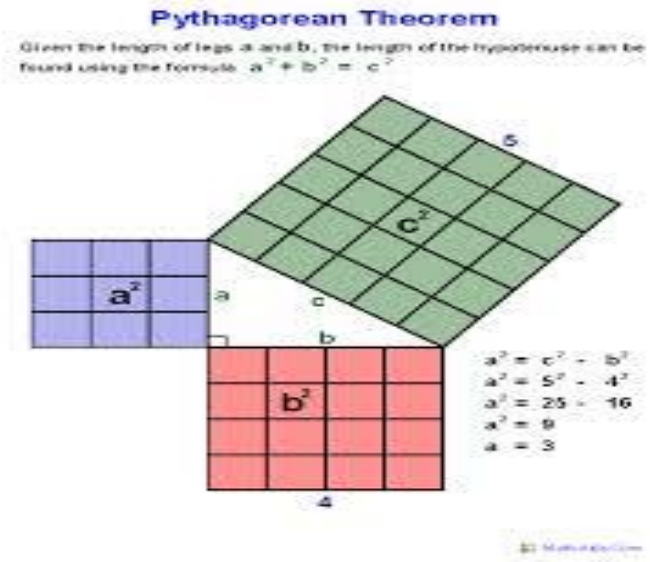
Interestingly, Baudhāyana used a rope as an example in the above shloka which can be translated as – **"A rope stretched along the length of the diagonal produces an area which the vertical and horizontal sides make together"**



Baudhāyana also provides a non-axiomatic demonstration using a rope measure of the reduced form of the Pythagorean theorem for an isosceles right triangle:

> *The cord which is stretched across a square produces an area double the size of the original square.*

Pythagoras was a Greek mathematician and a philosopher, but he was best known for his Pythagorean Theorem.



Materials:

- Paper sheet
- Unit Scale [Students have to define their own unit scale]

- Scissors
- Marker pen

Producer:

- First of all take a paper sheet.
- Cut into a right-angled triangle with help of scissors.
- Now measure the two sides, which makes 90° angle.
- Similarly, we will measure the remaining 3rd – side.
- Here, we can realize that sum of square of first two sides equal to the square of 3rd – side (AB2 + BC2 = AC2).

References:

[1] Website : *http://www.geom.uiuc.edu/~demo5337/Group3/hist.html*

[2]Website : *https://en.wikipedia.org/?title=Pythagorean_theorem*

[3]Website : *http://www-history.mcs.st-and.ac.uk/Biographies/Pythagoras.html*

[4]Video: *https://www.youtube.com/watch?v=PrjTkWGLk2Q*

[5] Video: *https://www.youtube.com/watch?v=FdMXjJunb1o*

Outcome:

After the complication of activity students are realize the use of Pythagoras theorem in various field, they can imagine the practical approach of mathematical formula.

Topic Name:

Newton’s motion laws

Objective:

Understand the Newton’s motions law with help of Bhagavad Gita’s chapter 4 (18th Sloka)

Activity:

You will be surprised to know that the Physics Laws you learn today has its roots in Ancient India. They were mentioned by Indian Rishis (scientists) in Vedas. You will definitely take pride in Indian History. Vaishesika sutras proposed 1800 years before Newton’s Three Laws of Motion. Actually Newton’s laws were explained by VAISHESHIKA SUTRA [1].

Vaishesika Sutras proposed 1800 years before Newton’s Three Laws of Motion

वेग: निमित्तविशेषात कर्मणो जायते |
Translation : Change of motion is due to impressed force.
(The law stated that an object at rest tends to stay at rest and an object in motion tends to stay in motion with the same speed and in the same direction unless acted upon by an unbalanced force.)

वेग: निमितापेक्षात कर्मणो जायते नियतदिक क्रियाप्रबन्धहेतु |
Translation : Change of motion is proportional to the impressed force and is in the direction of the force.

वेग: संयोगविशेषविरोधी |
Translation : Action and reaction are equal and opposite.

Materials:

- To jars (Plastic or glass)
- Flour of sand
- Iron filings or small lead pellets
- Meter scale

Producer:

- Fill one jar with flour or sand. Pack it tightly.
- Fill the other jar with iron filings or small lead pellets. Again, fill it tightly.

- Put lids on both of the jars. Lids should be on tight.
- Place both three-ring binders next to each other on a wooden or tile floor. Place each jar on its side and release both from the top of the "ramps" at exactly the same time.
- In the Table below, record how far each jar rolled. Do not measure the binder itself, just the distance from the end of the binder to where each jar actually stopped.
- Repeat Steps 3-4 for each of the surfaces listed on the Table. 7.
- Fill in the Table with your results for each race.
- After complete this activity tries to find activities related to newton's second and third law.

Table:

Sr. No.	Surface	How far did the empty jar travel?	How far did the filled jar travel?
1.			
2.			
3.			
4.			

References:

[1] *"The Vaisesika sutras of Kanada"*, by Nandalal Sinha, PIBN 100701606 (1923)

Outcome:

- Students able to correlate the Bhagavad Gita's 18th Sloka in chapter 4 with Newton's motion law
- Also understand the Newton's law (2nd & 3rd) with help of activity design by them.

Topic Name:

Gravitation Force

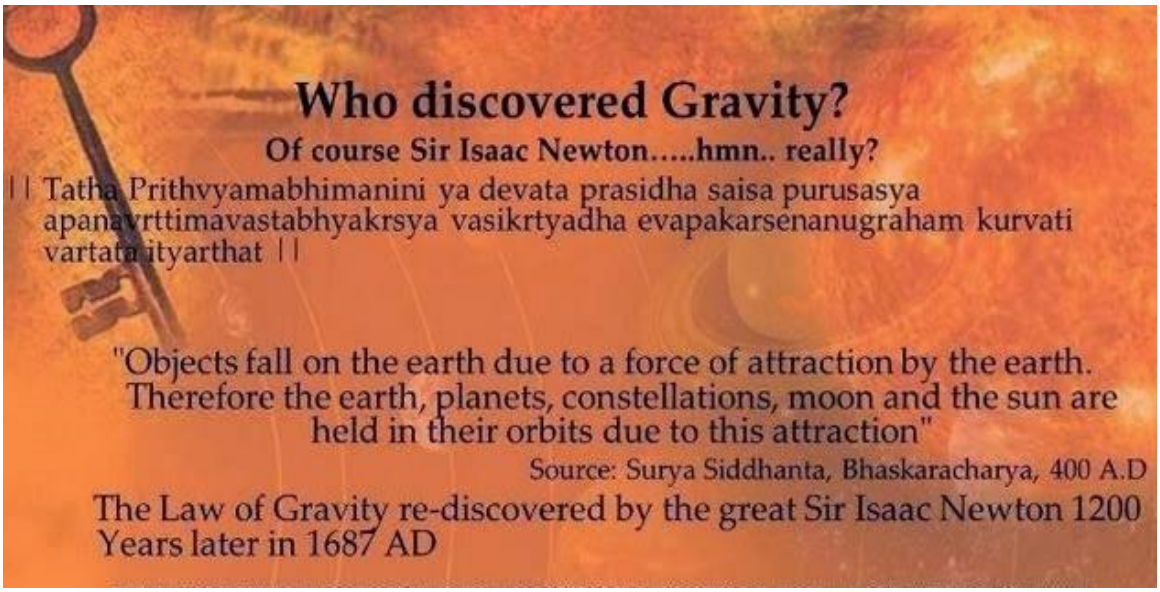
Objective:

To know the how all object fall down to the earth with help of universal law.

Activity:

"Objects fall on the earth due to a force of attraction by the earth. Therefore, the earth, planets, constellations, moon and sun are held in orbit due to this attraction."

You guessed which law of above is? Obviously you give answer to that of Newton's law of Gravity. This law is not given by the European scientist Newton first time before him the Bhaskaracharya states these lines [1]. Approximately 1200 years later (1687 AD), Sir Isaac Newton rediscovered this law of Gravity.



Materials:

- Piece of paper
- Stone
- Meter scale

Producer :

1. Take piece of paper and a stone.
2. Now take a piece of paper in one hand and a stone on another hand.
3. Also you think which is heavier and which fall faster?
4. First roll the piece of paper up into a tight ball.
5. In one of height drop the stone and paper approximately the same time.
6. Note you do this activity where there is no air.
7. Note that which landed on the ground first? And why?
8. You people repeat this activity with any similar containers

References:

[1] E. Burgess, Surya-Siddhanta, A text book Hindu Astronomy, American Oriental Society, 1856-60

Outcome:

- Students understand the Universal law.
- After complete this activity they are able to design more activities for gravitational law.
- Students will conclude the activity (one or two group of students can present what they have learnt during activity)

Topic Name:

Earth Magnetic Field

Objective:

To know the direction of N- pole and S- pole and magnetic field lines.

Activity:

History:

Ancient history of electromagnetic theory was first observed by “Thales of Miletus” in 6th century BC (624BC - 546BC) [1], while observing the rubbing fur on amber. He observed that there was attraction between two; which is known as static electricity [2].

Apparatus:

- Iron filings
- Piece of paper
- Bar magnet

Observation:

- Place a stiff piece of paper over a bar magnet that is resting on a flat surface.
- Sprinkle some iron filings on the piece of paper.
- Students observe what happens.
- The interesting pattern that results is due to the magnetic field surrounding the magnet.
- Now draw the magnetic field pattern, it is important to include arrow to show the direction of field.
- The arrows always point away from the magnet’s North Pole and towards the magnet’s South Pole.

Theory:

However, with electric charges you can have just a positive charge, like a proton, or just a negative charge, like an electron. You can't do that with magnets, north will always be attached to a south and south will always attach to a north. Even if you break a permanent magnet in half both of the pieces will again have a north and a south. You can keep splitting the magnet, but it will always be a magnet with a north and a south. With electrical charges, like charges repel and opposite charges attract. It is the same with the magnetic poles. The north end of one magnet will be attracted to the south end of another.

References:

[1] *https://en.wikipedia.org/wiki/History_of_geomagnetism#Early_ideas_on_magnetism*

[2] *https://en.wikipedia.org/wiki/Timeline_of_electromagnetic_theory*

Outcome:

After completing this activity students able find the direction of magnetic field.

Topic Name:

Magnetic Levitation

Objective:

To understand the magnetic levitation phenomena

Activity:

History:

Magnetic levitation has been around for years [1] According to ancient Indian mythology Gods had a very special ability to fly in air. Behind this only levitation concept is there. Yogis, Brahmans & hermits could rise above the ground up to 90 cm and float in air [2] Different religious have various examples of levitation amongst their religion followers & it was generally used for showing the power of their religion [3].

The main advantage of magnetic levitation is for transportation. Magnetically levitated vehicles are called maglev vehicles. In this vehicle absence of contact between moving system and stationary system. Can you imagine a train that actually floats in air 4 to 6 inches in the air and travel up to 300 mph. With such an arrangement great speeds could be achieved with very low energy consumption.

Apparatus:

- Dowel rod
- Ceramic disk magnets
- Wooden block

Procedure:

- Place the end of the dowel rod into the hole in the block of wood to create a stand with the dowel mounted vertically.

- Place two disc magnets on the dowel rod (with the rod through the holes in the middle of the magnets). Do the magnets stick together, or does the top one "levitate" above the bottom one?
- What can you say about which poles of your magnets are towards each other? If your magnets are stuck together, slide the top one off, flip it over, and put it back on. It should now "levitate" above the other magnet.
- Predict what will happen if you press the top magnet down onto the bottom magnet, and then quickly release it. Then do it and describe what happens.
- Closely observe how far apart the two magnets are.
- Like this you will more magnetic disk and see what happen?

Theory:

The poles on the disk magnets are on the flat sides. Image one of the disk magnets is a coin (with a hole in the middle!). Heads is North, tails is South (or vice versa - but the point is that the flat sides are the poles). Two like poles are facing each other, so the magnets repel each other. The magnetic force between the two magnets pushes the top magnet upward, preventing it from sliding down on top of the bottom magnet. The force of gravity pulls down on the top magnet, preventing it from flying up off the top of the post. So two forces at play are gravity (pulling down) and magnetism (pushing up). The two forces are at equilibrium (they "balance out" each other), causing the top magnet to levitate a few centimeters above the bottom magnet

References:

[1] *http://www.faculty.rsu.edu/users/c/clayton/www/presson/paper.htm*

[2] *http://english.pravda.ru/society/anomal/09-11-2005/9197-levitation-0/*

[3] *https://en.wikipedia.org/wiki/Levitation_%28paranormal%29*

Outcome:

After completing this activity students will able to identify the difference between repulsion & attraction.

Topic Name:

Archimedes Principle

Objective:

The basic understanding of floating or sinking of an object in water must be inculcated within the students, to bridge the gap between laws of physics and its application with real time engineering.

Activity:

The history of Archimedes principle reveals a sheer worry of a king who thought he is tricked, for having an impure crown of gold mixed with silver. This worry, led to the invention of a great idea, on which many huge objects like ships, submarine, hot air balloons are operating. As the king approached his friend Archimedes, known to be the son of an astrologer, he started to work on this idea. One fine day, in deep thought, while bathing he noticed that when he climbed in to a soaking bath the water level went up. This led him to the idea that "Archimedes' states that a body immersed in a fluid is buoyed up by a force equal to the weight of the displaced fluid." He went naked shouting "Eureka Eureka" to the king when he found this. Hence, without destroying the crown, just by measuring the weight of crown and water it had displaced, it was found that the crown was adulterated. This led to a new start of forensic application too.

Today all the huge transportation vehicles like Ship, submarine, hot air balloons work on this principle of buoyancy.

Principle : *"an immersed body is buoyed up by a force that is equal to the weight of the fluid that it displaces"*

1. Take a large bowl and inside it take a small bowl.
2. Fill in the small bowl with water to some level.
3. Float the paper boat in it.
4. Now pour some salt in paper boat, it will sink a bit.
5. After that put a marble in paper boat, it will sink completely.

Reasoning:

- If the weight of the body is lesser than the force of buoyancy the body floats. Hence, paper boat floats.
- If the weight of the body is equal to force of buoyancy the body submerges, hence the paper boat with salt submerges.
- If the weight of the body is greater than the force of buoyancy the body sinks. Hence the boat with marble sinks.

References:

[1] Website : *www.wikipedia.com/search*

[2] Website : *www.wikihow.com*

[3] Website: *www.youtube .com*

Outcome:

Based on above activities, the following outcomes are expected:

- The basics of buoyancy and its application in real world are understood.
- As activity is done on practical basis, a deep insight on practical knowledge is gained.
- An application in real time is expected, in which Archimedes Principle can be applied.

Topic Name:

Cryptography

Objective:

Understanding the mechanism of encrypting and decrypting, to produce strong ciphers, that can have use in various fields of engineering.

Activity:

Throughout the history of Indian civilization, cryptography and the hiding of secrets advanced rapidly with the growth of their civilization. Many Indian rulers used cryptography to encode messages and directives to the vast network of spies they operated over the Indian subcontinent, as well as to covertly transmit and protect basic operational and financial information from subterfuge. Indian ciphers did not normally consist of direct character substitutions, but rather phonetic changes that allowed secret messages to be communicated through sign language and specialized spoken languages. Cryptography is the mechanism of encrypting data, to protect it from being read or edited by some external party. Cryptography today has expanded its wings in every part of technology right from cellular mobile communication, OTP, satellite communication up to military uses in wars. Cryptography plays a very important part in the designing of these applications. But, its birth had long been done in Indian history of Mahabharata. The two chakras – Chakravyuha and Padmavyuha whose appearance is like a blooming lotus, is actually, a multi-tire defensive information. Also, in World War II, cryptography had a great deal of input in providing secretive information safely. Charles Babbage's Crimean War was one of the earliest inventions in this field. Thus, cryptography has always been an important factor in understanding traditional as well as modern encryption and decryption schemes.

कटपयादि संख्या - kaTapayAdi for Melakarta Ragam Names & Numbers									
1	2	3	4	5	6	7	8	9	0
क	ख	ग	घ	ङ	च	छ	ज	झ	ञ
ट	ठ	ड	ढ	ण	त	थ	द	ध	न
प	फ	ब	भ	म					
य	र	ल	व	श	ष	स	ह		
ka	kha	ga	gha	nga	cha	Cha	ja	Jha	nya
Ta	Tha	Da	Dha	Na	ta	tha	da	dha	na
pa	pha	ba	bha	ma					
ya	ra	la	va	sha	Sha	sa	ha		

Principle: *"Encrypting a plain text by adding some thumb rule on it and transferring it to a cipher text. Decrypting the same text by reversely applying the rule, to obtain the plain text back."*

1. Take 3 students in a group.
2. Two will communicate through encryption process, by deciding upon a code.
3. Let the code be: Adding 3 to every letter. e.g. HI becomes KL, as 3 is added to H and 3 is also added to I.
4. The 3rd person has to try to decrypt or guess the increments for 2 minutes and then it will be handed over to the receiver.
5. Here if the 3rd person is able to successfully decrypt the code, it is a weak cipher.

But, if it's tough to decrypt it is a strong cipher.

References:

[1] Website : *www.wikipedia.com/search*

[2] Website : *www.wikihow.com*

[3] Website: *www.youtube .com*

[4] *http://www.conservapedia.com/Cryptography*

Outcome:

Based on above activities, the following outcomes are expected:

- The basic understanding of cipher will be embedded.
- Flaws of a weak cipher and that of a strong cipher will be understood.

Topic Name:

Town planning

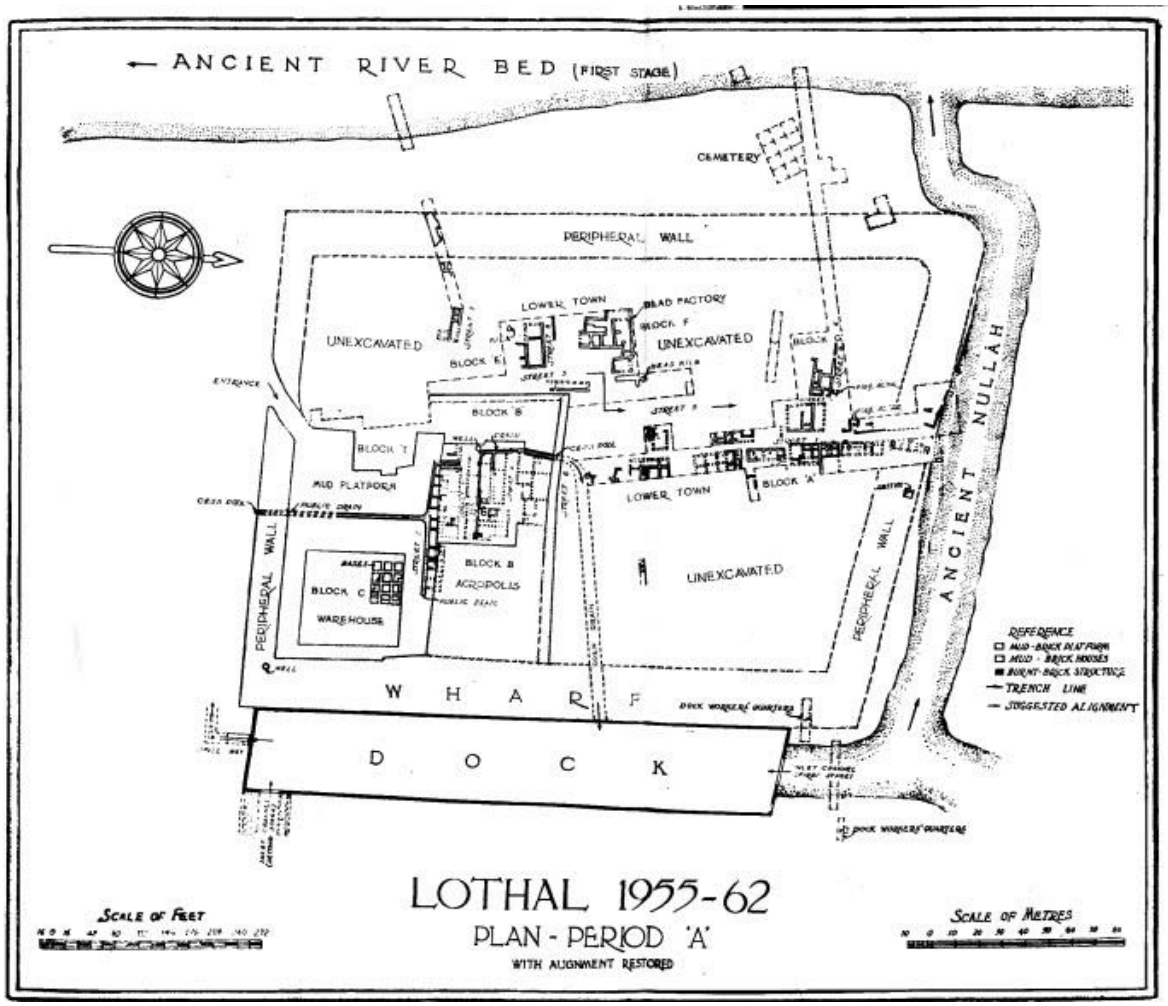
Objective:

- To contribute to a balanced town by ensuring that new and existing facilities are complimentary and well connected.
- To provide sustainable buildings that in environmental, social and economic terms can continue to flourish
- To offer attractive transport alternatives for people living, working and visiting the area and minimize car parking provision on site

Activity:

Lothal is one of the most prominent cities of the ancient Indus valley civilization. Located in the modern state of Gujarat and dating from 2400 BCE, it is one of India's most important archaeological site that dates from that era.

The first thing that strikes us with regard to Harappan culture is the town planning and urbanization. Mohenjo-Daro, Harappa, Lothal or Sutkagendor were built on similar plan. To the west of each a citadel built on a high platform suggest division in society or some upper class existence. It was defended by wall and on it were constructed the public buildings. Below this citadel was the town proper. Everywhere, the main streets ran from north to south and other streets ran at right angles to the main streets. Houses, residential or others stood on both sides of the streets. Both at Harappa and Mohenjo-Daro, houses were built of kiln-burnt bricks. At Lothal and Kalibangan, residential houses were made of sun-dried bricks. An average house had, besides kitchen and bath, four to six living rooms. Large houses with thirty rooms and staircases suggest that there were large two or three storied buildings. Most of the houses had wells within them and a drainage system carried the waste water to the main underground drain of the street. The city was surrounded by a wall to protect it from invaders and to mark the city limits. Areas outside city limits were left open as farmland. At the end of each main road was a large gateway with watchtowers.



Activity:

Things needed – A1 size sheet, pencil, eraser & ruler per group

1. Define the components like school, residential area, industry zone, park etc. to be mapped on paper and mention their base area with dimensions.
2. Include 1 component with greater height (like 100 feet structure) whose base area students will decide.
3. Brief the students with basic DOs of town planning
4. Students will arrange the defined blocks on paper within given time

References:

[1] Hindu Net : *http://www.hindunet.org/hindu_history/sarasvati/html/settlement_plans_and_architectur.htm*

[2] Wikipedia : *https://en.wikipedia.org/wiki/Lothal*

Outcome:

- Students will come to know what type of town planning will lead to development and satisfy the needs of diversity.
- Modern methods for master plan can be formed.
- Easy grasping and understanding of knowledge.
- Students are cultivated habit of promoting our culture at international level and enchant our mantras / principles of planning

Topic Name:

Finding North using Astrological Knowledge

Objective:

- To introduce the basics of Astrological Knowledge.
- To understand the Move and Rotation of Astrological Object in sky like Sun, Earth, Stars

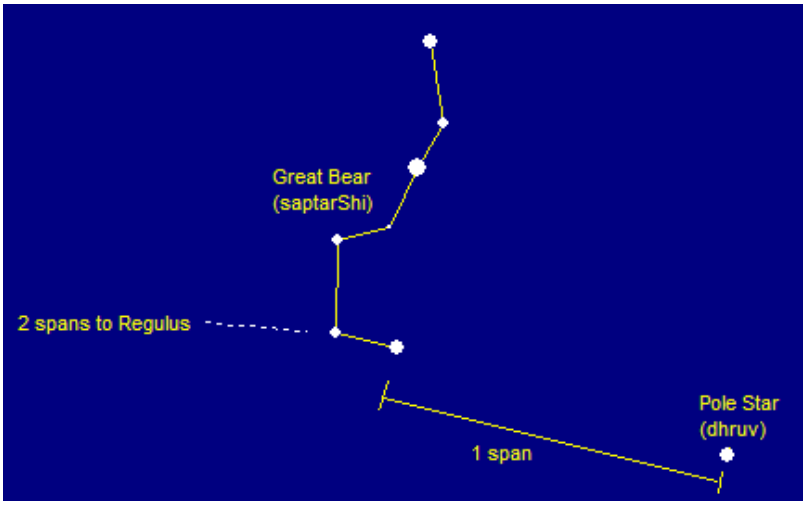
Activity:

Since thousands years stars and astrological objects are used to find direction. Especially We Indians are well known for our astrological knowledge.

In past Indian people used stars to identify their perfect direction of traveling on earth and sea. There are so many references found where Indians were traveling to Andaman island which required in-depth knowledge of direction because Andaman island is a group of very small islands far from Indian coast. In sea travel with this much precision is almost impossible without compass or other modern devices.

The top two stars of Saptarshi are well known as a pointer to the Pole star (Dhruv).[1]

Our activity will give you basic idea of finding direction towards north in night as it is difficult in comparison with day.



Step-1: Find Great Bear (Saptarshi) as shown in figure. It is easy to find due to its large size and distinct shape

Step-2: Find two stars that form the outer edge of the Great Bear (Saptarshi) as shown in figure.

Step-3: Draw an imaginary line straight through the two stars of the bear edge about 1 span (the outstretched measure from the thumb tip to little finger)

Step-4: This Pole(Dhruv) Star locate the North direction.[1]

References:

[1] *http://www.cse.iitk.ac.in/users/amit/story/10_cassini.html*

Outcome:

At the end of this activity, students should be able to:

- Find North direction in night.
- Understand basic astrological concept.

Bridge Course

Life Skill

Activity -1: To be happy and make others happy

	Name of the Activity	To be Happy and make Others Happy
1	Type of Activity	Group Activity
2	Objective	To make the students aware about the sources of happiness
3	Aim	Self-awareness, positive attitude towards life
4	Description/Execution	In this activity, teacher will show any videos regarding Happiness (i.e., video named “Happiness” by Deepak Manchanda). Students will discuss on the video in a group and will relate with their own lives and share among others.
5	No of Students can participate	50 to 60 (Depends on the Class)
6	Duration	approximately 1 hour (Depends on the Class)
7	Skills Developed	Interpersonal relationship, Positivity, Collaboration
8	Anticipated Problems & Solutions	**Problem: 1** All the students may not be able to co-relate the theme of the video with their own life **Solution: 1** Teacher should motivate and encourage them to remember such incidents when they made others happy **Problem: 2** Some students may become very emotional. **Solution: 2** Teacher should counsel them and be sympathetic.

Activity - 2: Anger Management

	Name of the Activity	Anger Management
1	Type of Activity	Individual Activity
2	Objective	Making students capable to control their anger and to deal with it in a positive way
3	Aim	Identifying possible solutions instantly, Assertiveness, Coping with stress and emotions
4	Description/Execution	Students will prepare the posters on 'Anger Management' theme and selected posters would be displayed on soft-board
5	No of Students can participate	All
6	Duration	2 hours
7	Skills Developed	Creative thinking, Presentation Skill, Improving Self-esteem, Time management
8	Anticipated Problems & Solutions	**Problem: 1** Some students may not be able to present their ideas on posters **Solution: 1** Students can share their ideas on Anger Management theme and teacher can guide on how to represent on paper **Problem: 2** Some students may not be able to prepare poster within allotted time limit **Solution: 2** They would be given extra time to finish their task

ACTIVITY - 3: ROLE PLAY

	Name of the Activity	Role Play
1	Type of Activity	Group Activity
2	Objective	To make students aware about the role of various characters
3	Aim	To appreciate and understand others' role in the life
4	Description/Execution	Teacher will give the specific role (i.e., teacher, mother, principal, banker etc..) to all students in a group and 10 minutes will be given for preparation and followed by the performance
5	No of Students can participate	5 to 8 in a group
6	Duration	10 Min per group
7	Skills Developed	Imaginative sympathy, Presentation skill, Social skill
8	Anticipated Problems & Solutions	**Problem: 1** Initially, Students may find difficulty to perform **Solution: 1** Teacher should motivate student and give brief idea of playing role **Problem: 2** Students may find difficulty to write script **Solution: 2** Teacher will give help during their preparation time

Activity - 4: Ideas Matter

	Name of the Activity	Ideas Matter
1	Type of Activity	Not Specific
2	Objective	To develop positive and problem solving mind set
3	Aim	To motivate students to express their views
4	Description/Execution	The class will be divided into two parts and teacher will give various problems of the life and after discussion both the parts have to find solution
5	No of Students can participate	All
6	Duration	2 hours
7	Skills Developed	Logical and critical thinking, Collaboration skill, increase confidence level
8	Anticipated Problems & Solutions	**Problem:1** In one part, there will be many students so all of them will have some other suggestions for solution **Solution:1** They can discuss and share the best solution **Problem:2** Students may not understand how to start thinking on the problem **Solution:2** Teacher can give some examples

Activity - 5: Motivational Movie club

	Name of the Activity	Motivational Movie Club
1	Type of Activity	Group Activity
2	Objective	To motivate the students to go beyond their capacity and develop "Can do" mindset
3	Aim	Through these exercise students can transform their mindset and take everything positively
4	Description/Execution	The students are divided into group of 8-10 according to strength of the class. Teacher will show the motivational videos in the classroom like: "Bhagvad Gita Saar", "Life Vest Inside- Kindness Boomerang", "Never Give Up- Nic Vujicic" – and students will discuss on the video in a group. They will explain the video after discussion and also share one story from their life when they were motivated by others.
5	No of Students can participate	50 to 60 (depends on the class)
6	Duration	Every Week
7	Skills Developed	Listening Skill, Simulate student's interest, Personality development
8	Anticipated Problems & Solutions	**Problem:1** Sometimes students may not understand the video **Solution:1**Teacher can play the video again **Problem:** 2 Though everyone is motivated from any person or object in their life but they are not aware. So initially students may not be able to remember their motivational story. **Solution:2** Initially, teacher can speak 1 example and then ask to follow same method

Name of the Activity	Activity Yoga, Tree Plantation and Thalassemia Awareness & Testing
Yoga	**a. Pranayamas:** bhastrika, anulom-vilom, kapalbhati, bahya, agnisar, bramri, udgit, ujjai shitli, sitkari nadisodhan, karnrogantak, suryabhedi, chandra bhedi etc . **b. Asanas;** **Standing Postures**: Garudasan, trikonasan, dhruvasan, natrajasan. **Sitting Postures:** yogmudrasan, baudhpadmasan, vakrasan, ardhmasendrasan, vajrasan, kukutasan, sidhasan, kapotasan, marjarasan **Prone Posture** Naukasan (viprit), bhekasan, dhanurasan,
Tree plantation	Focus should be made on native tree plant i.e. Neem, banayan, pepal, , gulmahor, son mahor etc.
Thalassemia Awareness & Testing	**Thalassemia Awareness & Testing**

EVALUATION REPORT SHEET

Major Activity Head - 1: Village Visit

Day	Date of Visit	Person Contacted	Designation / Profession of Person	Activity Carried Out	Sign of Person Contacted
1					
2					
3					
4					
5					
6					

Major Activity Head - 2: Learning Engineering

A) Technical Movies:			
Date & Day	**Name of Movies**	**Learning Outcome**	**Sign of the Faculty**
B) Bloom's Taxonomy:			
Date & Day	**Activity Name**	**Learning Outcome**	**Sign of the Faculty**
C) Presentation on Technical Disaster or Innovation:			
Date & Day	**Topic**	**Learning Outcome**	**Sign of the Faculty**

Major Activity Head - 3: History of Science and Technology

Activity No.	Day & Date	Activity Name	Learning Outcome	Sign of the Faculty
1				
2				
3				
4				
5				
6				
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8				
9				
10				
11				
12				

Major Activity Head - 4: Life Skills

Sr. No.	Day & Date	Activity Description	Behavioural Change	Sign of the Faculty