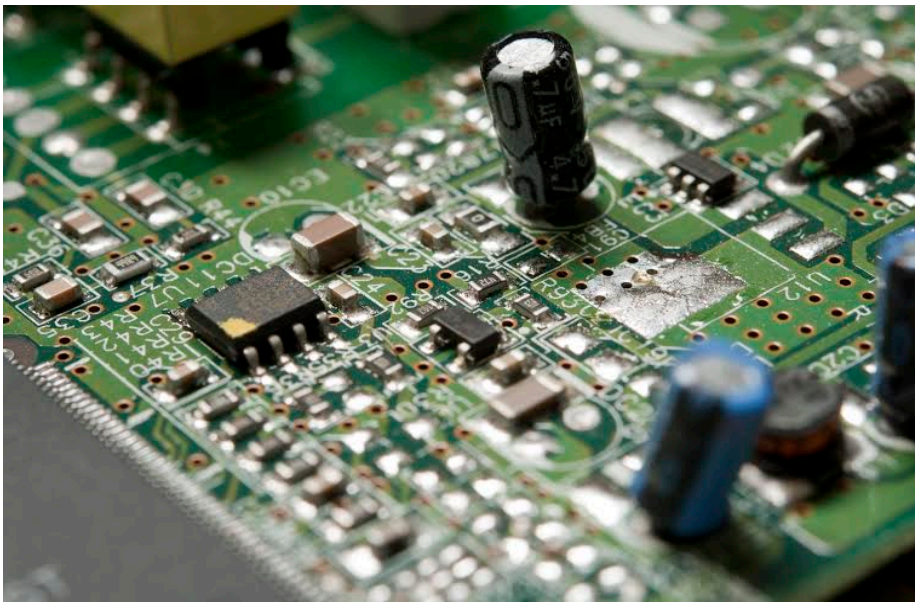
SHAASTRA CIRCUIT DESIGN CHALLENGE

1) ABSTRACT:

Transportation since its birth has had a huge advancement and now it's almost at its peak. Whenever we speak or think about transportation, the first picture that flashes in our head is ROADS. Yes, roads are the basic mode of transportation for all the people alike .Unlike Railways, Seaways or Airways, Road transport is easily feasible by any common man. It is this transport system that has changed the face of developing countries especially India. It has transformed many smaller villages and towns to huge metropolitan cities and has paved way for further scopes of development. But as they say no advancement comes without its flaws, Road transport also has its flaws, the biggest drawback-Road Traffics leading to accidents and others fatalities. As time passed number of vehicles increased on an exponential scale with the increase on roadways to meet population rise and that increased to traffics. No proper management of traffics and partly due to human negligence have lead to a rise in the scale of fatalities recently. We as engineers and the future of this country need to plan out and design systems so as to minimise these fatalities and reduce the prevailing problem of traffics, because now it has become a challenge and a topic that has reached the stared points of the priority list of national problems. So we as engineers hunt to find the prevailing problems and look out and call other engineers to find solutions to these problems for a better tomorrow.



2) Problem Statement :-

You are required to design, innovate and build a system to improve the road transport system. Basically you have 3 modules. Each module has two sub-modules. You can choose any one of sub-module and solve it. Solving more than one sub-module fetches you more points
.

3) Modules:

a) Energy conservation
b) Smart traffic lights
c) Safety device for vehicles

3.1 Energy conservation :

3.1.1 Automatic street lighting system :

Motivation:

Street lights are the major requirement in today's life of transportation for safety purposes and avoiding accidents during night. Despite that in today's busy life no one bothers to toggle it off when not required. It is one of the single largest energy expenses for a city, accounting for upwards of 35-45% of a municipality's utility budget. The main aim of this module is to give solution to this by eliminating manpower and reducing power consumption.

Design:

Design a street lighting system which automatically gets toggled depending on the lighting in that area and also offer on-demand lighting, meaning the right amount of light when and where it is necessary.

Design specifications:

Make a small prototype with road in centre and LED's(representing street lights) on both sides of the road(minimum 3 on each side)
The LED's should be off when there is sufficient amount of lighting in the room, even if the vehicles enter. When the room is dark and there is no vehicle on the road, the LED's should glow with less brightness and the brightness should increase when the vehicles (toy cars) enter.

Evaluation criteria:

You will be evaluated on:
1) Range of the sensing mechanism.
2) How spontaneous your system is? (Time of response)
3) How simple and cost effective your model is?

3.1.2 Power hump:

Motivation:

Energy is the primary need for survival of all organisms in the universe. Everything what happens in the surrounding is the expression of flow of energy in one of the forms. But in this fast moving world, population is increasing day by day and the conventional energy sources are lessening. The extensive usage of energy has resulted in an energy crisis over the few years. Therefore to overcome these problems, we need to implement the techniques of optimal utilisation of conventional for conservation of energy. This module aims to utilise the energy which is wasted when a vehicle passes over a speed breaker.

Design:

Design a prototype which can tap the energy generated and produce power by using speed breaker as a power generating unit.

Design specifications:

1.The humps should create the energy based on electric circuits the lesser amount of mechanical inputs the better .Credit will be given if there is minimal usage of mechanical gears and other stuffs.
2.Your prototype will be tested on a small road made of cardboard where you place your "power hump" and we will pass a toy car and your hump must be able to light an LED!
3.Extra credits will be given if after the car passes through, the LED keeps glowing for some more time.(i.e. is continuous power is generated)

3.2 Smart traffic lights

3.2.1 Traffic lights with automated ambulance detection

Motivation:

The Red Cross glaring on the rear view mirror of your car, and the sound of the siren ringing alarm bells on your eardrums, the feel that you get on seeing the ambulance struck behind you, in a traffic that looks like it's going to end in Zenith and then you start to pity the poor person and his or her family for their plight and then you resume to your wait to hit the gas once the green signal glows.
Don't want such a thing to happen? Then it's up to you to design a measure to pave way to the ambulance!

Design:

Design a prototype of a junction including traffic lights on all the four sides that detects the ambulance and glows green automatically in that particular direction.

Design Specifications:

1) When there is no ambulance, traffic lights should function normally.
2) When the ambulance is detected in a particular direction, that corresponding traffic light should turn green and if it already green, it should hold on till the ambulance leaves.
3) When there is more than one ambulance, the one which comes first should be given preference.

Evaluation Criteria:

You will be evaluated on:
1) Range of the sensing mechanism.
2) How spontaneous your system is? (Time of response)
3) How simple and cost effective your model is?

3.2.2 Traffic lights that switch accordingly by detecting traffic density

Motivation:

Think of a time when you are going for an important work and you leave long before the appointed time but just due to the road that you chose to tread past is full of traffic and other lanes empty, and then you miss the interview because you arrived late ,without it being your fault!! That's painful, isn't it???Such things happen every day . The frequently used roads are under the traffic zone while the almost unused lanes are left open to green light for long intervals… Think you can work that out??????? Go ahead!! Give it a shot and come up with an idea to smartly change the traffic signal to give way to the busy lanes!!!

This project aims at designing and implementing a running model of traffic light controller which is controlled according to the density of vehicles on road.

Design:

Make a small prototype representing a junction with LED's as traffic light and show a demo how the traffic lights glow when there were appropriate amount of vehicles on either side of the junction and many vehicles on one side with very less vehicles on the other side of the junction.

Design specifications:

1.The junction should have four traffic signals one on each side of the road that is one facing each of the four cross roads
2.It will be preferable if the traffic light junction is placed at the centre of the cross road
3.You have to show that when there is no vehicle on one road and some vehicles on other the traffic lights should turn green on the corresponding side. Once the vehicles cross over the green light should hold for some time and then it should switch back to normal operation.
4.Extra credit will be given if traffic densities are compared, for example if there is one vehicle on one road and 4 on the other the traffic light should show green on the lane having four vehicles first hold for sometime after all the four vehicles pass then switch to the one that has one vehicle and so on .So if all lanes have vehicles the maximum density is given first preference then holds for sometime then the next and so on.

Evaluation criteria:

1) For how many cases your system responds.
2) How fast the response is.
3) How Simple and cost effective your design is.

3.3 Safety device for vehicles:

3.3.1 Alcohol sensor

Motivation:

With India reporting as many as 1.34 lakh fatalities in road accidents every year, a vast 70 per cent of them being due to drunken driving. While developed countries through well planned road safety have succeeded in bringing down their accident rates, India's accident rate and fatalities are showing an increasing trend which is a matter of concern mainly due to drunken driving.
A device with innovative idea results in accident free India.

Design:

Make a device that beeps the siren when alcohol content is detected in driver's breathe.

Design specifications and Evaluation Criteria:

1.Credit will only be given if proper norms of alcohol detection is followed that is to say the limiting factor will be carefully noted .If your detector does not satisfy or runs above the value of limiting factor by marginal values , you will be penalised, So take care!!
2.Also make sure you deal with alcohol only, other aerated drinks or energy drinks that have alcohol content should not beep the siren else you will be penalised(as their alcohol content is too low). This will be valued as well. So take note!!

3.3.2 Speed controller :

Motivation:

Speed control is in the need of the hour due to the increased rate of accidents reported in our day-to-day life. During 2011, in India a whole of 4,97,686 road accidents were reported which is a result of lack of speed control. The aim of this module is to build up a device to reduce accidents due to speed control.

Design:

Design a digital speedometer which controls the speed.

Design Specifications:
1) You are expected to design a digital speedometer which displays the speed of the vehicle at any instant
2) It should also display the distance covered by the vehicle from the beginning.
in

Evaluation criteria:

1) Accuracy in speed and distance will be the important criteria's and you will be credited on the basis of these parameters.
2.) Time response should be in sync. with the way the model car is passed through the sensors. Lags and errors should be minimised.

Extra Module:

Apart from these, you can come up with your own idea and design a circuit to implement it. This fetches you extra credits. However at least one of the above 3 modules have to be solved prior to this.

As Shaastra follows the motto for SPIRIT OF ENGINEERING, CREATIVITY AND INNOVATION will be highly valued and perked as well. So bear this in mind while you deal with your models.

4) Points:

1) Each sub module fetches you maximum of 50 points.
2) Extra module is evaluated based on idea and solution for it and can get a maximum of 50 points.
3) Interdependence of the modules fetches extra points.

Note: You will be given extra credits for completing a sub module (that is if the module works perfectly without any hitches. Plus the innovation or idea behind the sub module too will be considered for the extra credits! So don't forget to **INNOVATE**!)