SAEINDIA

STUDENT CONVENTION '19-'20

RULE BOOK

SAEINDIA
SOUTHERN SECTION

SAEINDIA
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STUDENT
CONVENTION
Challenge Ahead

SAEISS STUDENT CONVENTION RULE BOOK 2019-20

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1. Modeling and Kinematic check

Purpose of the event

- Modeling and Kinematically check a given assembly or mechanism through a solid modeling software (Creo, CATIA, SolidWorks). The possible assemblies are as details in the sections below.

Eligibility Criteria – participants

- Must have SAEINDIA membership
- Must have basic knowledge on kinematics
- Must have basic software knowledge

Alignment with curriculum

- Converting a drawing/ illustration into part.
- Physical linkages.
- Materials and their properties.
- Kinematics behavior of mechanism.

Expected skills

Tier-1	Tier-2	Tier-3
Creation of solid model/assembly and their relative movements prediction of area, volume and mass.	Explain the function of an assembly through animation to demonstrate the various degrees of freedom.	Define and explain the math model behind the functioning of the part and assembly and check for the Kinematic response for variation of parameters in the model.

S.no	Division Centre	Topic
1	Chennai division	Engine and subsystems
2	Mahindra World City Division	Transmission (gear box ,clutch ,rear axle etc.)
3	Coimbatore Division	Steering system and components
4	Madurai Division	Seating and door systems
5	Hyderabad Division	Braking system and components
6	Cochin	Transmission (gear box ,clutch ,rear axle etc.)

7	Amaravati	Suspension system and components
8	Erode	Engine and subsystems
9	Thirunelveli	Braking system and components
10	Hosur	Seating and door systems
11	Thanjavur	Suspension system and components
12	Orgadam	Steering system and components

Kits and aids

- Creo , CATIA, SolidWorks etc.,

Competition rules

- Actual modeling/assembly done offline
- Participant should provide proof that it was done by the participants
- 10 min Presentation at the competition
- Animation video to be submitted
- Models must be done using Creo, CATIA, and SolidWorks software.
- Individual colleges will follow the topics allocated to their divisions.

Team Size

- Team size: 3 students
- Number of teams for Tier-1: as many as possible
- One team from each college moves to Tier-2 (Division level)
- First two teams from each division moves to Tier-3(Convention)

Judging criteria

Tier-1	Tier-2	Tier-3
Quality of solid models - 40%	Quality of solid models - 30%	Quality of solid models - 20%
Prediction of area, volume and mass - 30%	Prediction of area, volume and mass - 20%	Prediction of area, volume and mass - 10%
Choice of materials and their properties - 30%	Choice of materials and their properties - 20%	Choice of materials and their properties - 10%
level of appropriate model with respect to drawing and correlate its mass with respect to actual part.	Explanation relative motion its function - 30%	Explanation relative motion and function - 30%
Level of approximation with ignoring radius /fillet /chamfer /draft angle thread	To show the animation for changing various parameters in the model and the resultant displacement – 20%	Animation of math model in relation to product function- 30%
	To show in various projections – 10%	

2. Structural and Dynamic analysis

Purpose of the event

- To understand the function of the given part and analysis the part for strength and stiffness for the given loads and service conditions.

Eligibility Criteria - Participants

- Must have SAEINDIA membership
- Must have basic knowledge on Structure building
- Must have basic knowledge on Dynamic analysis
- Must have good software knowledge to interpret the results.

Alignment with curriculum

- Engineering mechanics.
- Theory of machines.
- Finite element analysis.
- Engineering materials and their properties.

Expected skills

Tier-1	Tier-2	Tier-3
Understand the function of the part and assessing the loads acting on the parts and boundary conditions. Develop the governing equations. Understand the natural and essential boundary conditions.	Convert create a FEM model and carry out static analysis using (ANSYS is Preferable) Mesh convergence and the effect on the required results.	Carry out dynamic analysis and using a FEA solver (ANSYS is Preferable) Modal analysis. Validate the results from the solver with Matlab etc.

Kits and aids

- Colleges not having desired software can approach SAEINDIA for usage of the Software.

Competition rule

- Structural (Static, Dynamic) problem given at the time of event from automotive domain.
- The assembly should have minimum 3parts and maximum of 5 parts.
- Software may be ANSYS or any other FEA solver (For pre-processing, solution and post processing).

Team Size

- Team size: 3 students.
- Number of teams for Tier-1 as many as possible.
- One team from each college moves to Tier-2 (Divisional level).
- First two teams from each division moves to Tier- 3(Student Convention).

Judging criteria

Tier-1	Tier-2	Tier-3
Quality of function analysis	Degrees of freedom	Degrees of freedom
Free body diagram	Estimating loads and load cases	Estimating loads and load cases
Estimating loads	Defining boundary conditions	Defining fixations
Defining fixations	Choice of load conditions	Choice of load conditions
	Choice of boundary conditions	Choice of boundary conditions
	Element type selection	Element selection
	Mesh sizing and conventional study	Mesh sizing
	Material allocation	Material allocation
	Interpretation/inference of static analysis results	Interpretation of static analysis results
		Interpretation of dynamic analysis results and critical frequency.

3. Computer Aided Manufacturing Competition

Purpose of the event

- The students pick up an automotive part and propose manufacturing sequence of operations and appropriate computer aided manufacturing programs as applicable.

Eligibility Criteria Participants

- Must have SAEINDIA membership.
- Must have basic knowledge on Manufacturing.
- Must have basic Computer Aided Manufacturing knowledge.

Alignment with curriculum

- Materials and manufacturing processes .
- Production technology.
- Computer Aided Manufacturing (CAM).

Expected skills

Tier-1	Tier-2	Tier-3
Identify manufacturing method and appropriate manufacturing stage to complete the machine.	Define various sequence and machining and appropriate machining steps and identify the scope of CAM	Application of CAM for the identified sequence of steps and optimize the CAM sequence and appropriate CAM Commands

Kits and aids expected

- Creo, CATIA, Solidworks is Preferable.

Competition rules

- Actual Work to be done offline.
- 10 Min Presentation at the competition.
- Models must be done using any other CAD software.

Team Size

- Team size: 3 students.
- Number of teams for Tier-1 as many as possible.
- One team from each college moves to Tier-2 (Divisional level).
- Two teams from each division moves to Tier- 3(Student Convention).

Judging criteria and Marking Scheme

Tier-1	Tier-2	Tier-3
Quality of function analysis	Quality of function analysis	Material properties required
Material properties required	Material properties required	Finish and precision required and its value to be achieved.
Finish and precision required	Finish and precision required	Correctness of manufacturing process for the material, finish and precision
Correctness of material	Correctness of material	Process flow for the chosen process with respect to sequence of operations
Correctness of manufacturing process for the material, finish and precision	Correctness of manufacturing	CAM Program
	Process for the material , finish and precision.	Tool path optimization
	Process flow for the chosen process	Simulation of the process
	Appropriateness of CAM application	
	CAM program	

Score split-up shall be decided on the spot by Judges before the competition

4. Business Plan competition

Introduction

India, the largest democratic republic in the world has a very high number of unemployed youngsters. Providing jobs to such a larger group is highly impossible unless the number of employers increases. Hence, the need of the hour is to increase the number of entrepreneurs who are potential employers.

Purpose of the event

To create a scenario wherein young entrepreneurs develop a business plan to establish a new organization to generate job.

Eligibility Criteria Participants

- Must have SAEINDIA membership.
- Must have clear idea on Business Planning.

Expected skills

Tier-1
Objective ● To allow participants to study about a company and its operational model. ● To understand the basic concepts of doing a business. ● To induce the participants to generate new ideas. **Choosing the Company** The teams are asked to choose a company which was started and currently existing in India for more than 3 years. ● The company should fall under any of the following sectors – Automobile Retail & E-Commerce, Agro-based, IT, FMCG, Food, Travel, Pharma, Environment. ● The company should be active and doing business.

Tier-2
The team selected for Tier-2 should draft a marketing plan with the idea that they have proposed at Tier- 1 level and should use the knowledge gained from Tier-1 to frame an effective plan in the following format ● SWOT Analysis ● Company offerings to the customer's needs and benefits. ● Target market ● Marketing strategies ● USP if any ● Competitive analysis ● Team member, their roles and responsibilities ● Road Map for 3 years and projected balance sheet. Investment required initially and justification and cash flow required along with projected revenue along with dependencies.

Tier-3
The format is similar to the Tier-2 presentation. But the contestants from Tier 2 who qualify for Tier-3 will be mentored by a team of young entrepreneurs.

Presentation Format

- Presentation should mention the company name and its sector and the management team along with its product and services.
- Explain one key product/service in detail, and its customer's benefits.
- Mention its various marketing channels and its initial marketing strategies.
- Your USP to compete with competitors.
- If given a chance to start a company on their own, give details about the launch of the product and its relevance to the customer in any sector.

Competition rules

Business plan reporting

- Written plan as per the standard format only (<2000 words)
- Presentation (<15 slides)

Team Size

- Team size is 3, in order to make everyone contribute towards preparing & presenting a plan in an effective manner
- Any number of teams for Tier-1. The winner of Tier-1 shall be allowed to participate in Tier-2 and the winner & runners of Tier-2 from each division shall be allowed to participate in Tier 3 levels.

Judging criteria and Marking Scheme

Tier-1	Marks	Tier-2 + Tier-3	Marks
Selection of company according to the rule company overview	5	Selection of company and sector (reason)	10
Quality of business plan(Product – technology service)	20	Product knowledge and uniqueness of the product for product appeal	20
Market potential, traction and milestones (business plan)	20	Customers need and potential	30
Competitive analysis and value proposition	10	Key marketing strategy	20
Feasibility / financial analysis and functioning requirement	20	Competitive analysis value proposition	20
Presentation	15		
Q/A	10		

5. Technical Paper Presentation Competition

Purpose of the event

- The student selects a topic from the given list, collects information and presents the chosen subject in front of the judging panel

Eligibility criteria

- Participants must have SAEINDIA membership
- Must have technical knowledge
- Must have good communication skills
- Capable of identifying the problem and optimization of solution

Alignment with curriculum

- Converting a drawing/ illustration into part.
- Physical linkages.
- Materials and their properties.
- Kinematics behavior mechanism.

Expected skills

Tier-1	Tier-2	Tier-3
• Basic data collection • Logical reporting	• Good depth of data collection • Correlation of data collected from different sources and conclusion	• Quantitative validation of original idea either through theoretical investigation or experimental investigation • (Note: the participant must submit 2-d, 3-d modeling and analysis in software, depending upon the type of paper presented)

Kits and aids expected

- None

Topics

- Alternate Propulsion Technologies
- Advanced Engine Technologies
- Fuel Injection Systems
- Hybrid and Electric vehicles
- Emerging Fuels and Fuel Cells
- Energy Storage Systems and Infrastructure
- Safety and Crash
- NVH and Cabin Comfort
- Automobile emissions and after treatments
- 3R-reduse, reuse and recycle
- Automotive electronics
- Vehicle Communications Network
- Nanotechnology
- Advanced lightweight materials
- Aero structure and technologies
- Off highway vehicles
- Vehicle body structures and frames
- Vehicle dynamics and handling
- Fuel economy and CO_2
- Dynamic modeling processes
- Automotive testing and instrumentation
- Vehicle architecture
- Product development tools and techniques
- Policies, regulations and standards
- Public, private and academic partnerships

Competition rules

Presentation in the competition

- 7-minute presentation
- 3-minute question and answer

Team size

- Team size: 3 students
- Number of teams for Tier-1: as many as possible
- The winner of Tier-1 shall be allowed to participate in Tier-2 and the winner and runners of tier -2 from each division shall be allowed to participate in tier -3 levels.

Judging criteria and Marking scheme

Tier-1	Tier-2	Tier-3
Quality of paper -70% Criteria : At par to SAE international		Quality and content as per SAE international of paper -40%
		For design and analysis -30% Criteria: Based on drawing views, objective and conformity of 2-D, 3-D and Analysis design.
		Presentation / Quality of technical content - 30% Criteria: Quality of slides, Question & answer, Data collection

6. Auto Quiz competition

The concept

Checking the general knowledge of the participants related to the automotive and related subjects mentioned below.

- History
- Places
- Personalities
- Technologies
- Companies
- Vehicle types and specifications
- Statistics of vehicles and so on
- All Automotive related subjects (as part of curriculum)

Eligibility Criteria Participants

- Must have SAEINDIA membership
- Must have knowledge on automotive related subjects

Expected skills

Tier-1	Tier-2	Tier-3
Generic answers with aids using clue and so on.	Generic answers without aids.	Specific answers with or without aids
Less questions	Medium level of questions.	More questions and multiple rounds

Kits and aids expected

Not applicable.

Competition rules

Stages of the event

- Quiz may be conducted on the following rounds
- General/Audio Visual/Specialization/Rapid Fire/Jackpot round.

Time per team for answers

- For rounds other than rapid fire
- 30 seconds on direct

- 15 seconds on pass
- For rapid fire round
- 120 seconds for 10 questions

Team Size

- Team size: 3 students
- Maximum Number of teams for Tier-1
- One team from each college moves to Tier-2 (division level)
- Two teams from each division moves to Tier-3 (convention)

Difficulty and number questions

- As per the expectations at different Tiers mentioned above

Marking Scheme

- First time right 5 marks
- Bonus 1 mark
- Rapid fire 2 marks for right answer
- Negative mark -1 for wrong answer as per the following rules
- Tier-1 No negative marks

7. CFD Analysis Contest

Purpose of the event

- Build a CFD model
- Analyze the model for flow and thermal distribution
- CFD to demonstrate thermal conductivity of a part.

Eligibility Criteria Participant

- Must have SAEINDIA membership
- Must have basic knowledge on Fluid Dynamics
- Must have basic software knowledge

Alignment with curriculum

- Thermodynamic
- Thermal engineering
- Heat and mass transfer
- Validating design procedure.

Expected skills

Tier-1	Tier-2	Tier-3
Discretize the model with appropriate CFD models techniques using CFD Tool and then perform steady state analysis.	Carry out basic Optimization Process through different techniques as per model	Modify the optimized model as per the thermal conductivity and then perform the steady state analysis to compare design performance. Validate with Matlab.

Competition rules

- Problem is given in the event. Students solve the CFD problem.
- Students have to use CFD software to demonstrate.
- Validation of results with appropriate methods (analytically or matlab)

Kits and aids

- Colleges not having desired software can approach SAEINDIA for help in the same.

Team Size

- Team Size : 3 Students per team
- Number of Teams for Tier-1 : as many as possible
- One team from each college will participate in Tier-2 (Division Level)
- Top 2 teams from each division will participate in Tier-3 (Convention Level)

Judging criteria

Tier-1	Tier-2	Tier-3
Model Preparation	Model Preparation	Type of meshing
Type of meshing	Type of meshing	Mesh Quality
Mesh Quality	Mesh Quality	Choice of loads and boundary condition
Choice of loads and boundary condition	Choice of loads and boundary condition	Material & property selection
Material & property selection	Material & property selection	Result interpretation
Analysis	Result interpretation	Type of meshing
Result interpretation	Type of optimization discipline	Type of optimization discipline
	Selection of Objective for Optimization and process	Selection of Objective for Optimization and process
		Modifying the geometry as per manufacturability
		Result comparison
		Suggestions for improvement of design

8. Plastic Mold Engineering Challenge

Purpose of the event

- Plastic Die Engineering is to develop products in 2D and 3D models of new product. A basic knowledge on mold, dies and different types of molding techniques.

Eligibility Criteria participants

- Must have basic knowledge on Mold design
- Must have basic CAD software knowledge
- Must have knowledge in machining
- Must have basic knowledge in CNC coding and simulation

Expected skills

- Knowledge in 3D design software, CNC program coding.
- Knowledge on a range of tools and their usage in relation to Plastic Die Engineering. Knowledge of materials and their characteristics. For example flow ability, molding temperature, percentage of shrinkages...
- Apply principles that ensure mass production and maximize product life expectancy.

Tier-1	Tier-2	Tier-3
General write-up on die manufacturing industry. Make male and female die cad model of given product. Materials for different die casting process.	Generate two dies in cad software. Write a CNC program manually of given part. Develop the CNC program in any software. Simulate the CNC program	Cut the part in given metal workpiece in CNC machine. Make the part using plastic material and die manufactured .

Kits and aids

- To be provided by the organizing committee by consulting the industry experts on the event day. This would be a typical part/assembly that is available in day to day work.

Team Size

- 3 per team
- One student each to work on the analysis and design of mold.
- Two students to work on CNC programming and machining of components.
- Number of Teams for Tier-1 : as many as possible
- One team from each college will participate in Tier-2 (Division Level)
- Top 2 teams from each division will participate in Tier-3 (Convention Leve

Judging criteria

- Analyze the product and model the mold design using 3D designing software.
- Generation of CNC program for their design and simulating using CAM software.
- Usage of Program Code, Machining operations and mould assembly.
- Dimensional accuracy.

9. Polymechanics and Automation

Objectives

- Polymechanics and automation is the modern generation competition
- The competition is completely based on modern automotive industry requirements and provides unmatched exposure.
- The events are open to all students and faculty members of SAE INDIA.

Purpose of the event

The aim of this competition is to bridge the gap between the industry and the university by providing a chance for students to explore a whole new area of automation and ploy mechanics, which is the future demand of the automotive industry.

Eligibility Criteria

Basic pen paper quiz level.

PLC programing

- All participants should be SAE INDIA members
- All 2nd, 3rd and final year students can take part in the event.

Expected Skills

- Modern manufacturing process and machine
- Understanding and interpretation of engineering drawings
- Terminology and symbols used in engineering drawings and specifications
- Types and characteristics of materials used in the manufacturing industry for different automotive components.
- How part is manufactured using engineering machine tools such as milling, turning and grinding.
- Principles of pneumatics in automation projects.

Tier-1	Tier-2	Tier-3
basic pen paper quiz level. Identification of parts in automation PLC program of given problem	Develop Hydraulic and pneumatic circuits of given problem.	Simulate circuits using software's like SIEMENS

Kits and aids expected

Engineering drawing will be provided by the organizer and will be from the field of automotive engineering.

Competition rules

- Evaluation by the judges will be final in all regards.

Team Size

- Maximum of 3 members.

Judging criteria

- Produce basic 3D parts using the given geometry information.
- Produce and initialize basic PLC programs for sequence replay.

10. Prototype Modeling

Purpose of the event

Prototype Modeling engineers are developers or producers of 3D new product models. New product is designed and developed based on a concept and the next step is to make a mockup to have a look and feel of the eventual product.

Eligibility Criteria

2D Sketching, Clay Molding, Creativity

Kits and aids expected

- Students should not wear loose dresses to ensure their safety in the machine shop.
- They should bring the necessary stationery items as required.
- The required material for this round (Ex: Clay, Colors, Stickers) will be provided by the organizing committee.

Competition rules

Tier-1	Tier-2	Tier-3
Analyze the problem statement, the team must design the model through 2D sketches and dimension.	Team has to make the prototype model of their design by using the clay and decorate it with given materials.	Team has to make the scaled prototype model using principles of dimensionless numbers of their design by using the clay and decorate it with given materials. And optimize the material usage

- The final prototype will be judged comparing the initial design.

Team Size: Maximum 3 students.

Judging Criteria

- Marks for each team will be awarded by an expert, based on the accuracy and time taken to complete the event which may be stated before the start of the event.

11. Welding

Purpose of the event

Understanding the given concept and weld 2 components.

Expected Skills

Each team should weld a Lap, Butt, and Corner T joint with the given rectangular plate. (Mild Steel)

Kits and Aids

- Materials Supplied in Toolbox
- Non-consumable materials, equipment and tools to be supplied by the Competitor.
- All standard equipment as needed may be provided by the organizers.
- Any specific that is needed shall be indicated while registration.
- Competitors may use their own TIG, MIG, ARC WELDING & GAS WELDING pieces/torches;

Expected Rules

- Contestants must be enrolled as a SAE member in his college
- One team from each college moves to Tier II (Division Level)
- Two teams from each division moves to Tier III (Convention)

Tier-1	Tier-2	Tier-3
Each team should weld a Lap, Butt, Corner & T joint with the given rectangular plate. (Mild Steel)	Each Team should weld a model using the supplied kit. Weld can be of any type (Lap, Butt, and Corner & T joint). Models can be rectangular plates or roll bars (Mild Steel)	Each team should weld a model using Roll cage pipes (Mild Steel), as in Baja or Supra.

Team Size

Maximum 3 members per team

Judging Criteria

S.No	Criterion	Marks
1	Dimension of weld	20
2	Quality of weld	20
3	Inspection	30
4	Testing	30
Total marks		**100**

Note: The participants can bring their own safety equipment like goggles, shield etc... For the event.

12. Mobile Robotics – Just Do It

Purpose of the event

- Engineers have to come up with optimized solution to given constraints and parameters.
- Given sequence of factory shop floor where components with technical defects are placed among the normal component. Mobile robot has to sense and pick the component and place it in the rejected lot.
- Analyze the situation and build a robot with required constraints and parameters to accomplish the given task.

Eligibility Criteria Participant

- Must have SAEINDIA membership
- Must have basic knowledge on robotics
- Must have basic knowledge on programming

Expected skills

- Basic microcontroller programming
- Selection procedure of drives and sensors
- Problem analysis and quick resolution capability

• Tier-1	Tier-2	Tier-3
Make simple robots using Arduino	Present your robot doing a specific function	Test your Robot which perform multi tasks in a production line

Competition Rules

- The team has to test the robot in the given layout.
- The final bot will be judged comparing with respect to the initial design document
- Endurance and durability of the robot will be taken into concern.

Team Size

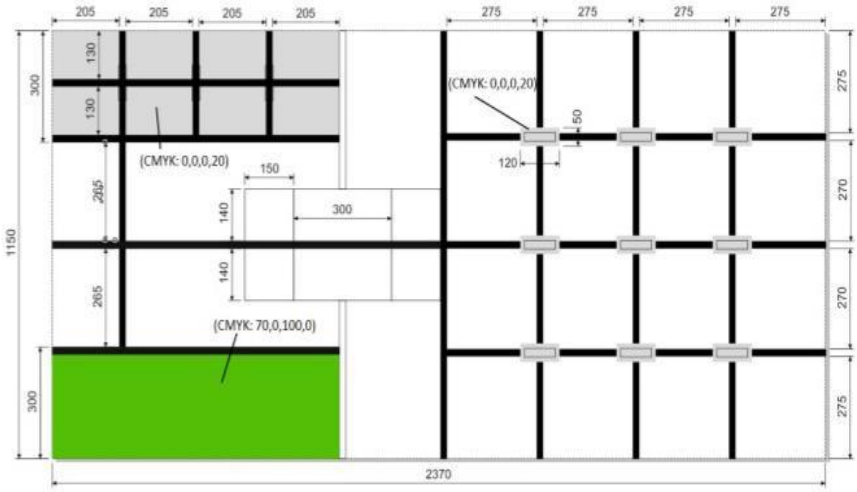
- Team size: 3 (For Mechanical) and Task to be done is Formulation and Logic.
- Team size: 3 (For EEE/ECE/EI/CS/IT) and Task to be done is Programming.

Judging criteria and Marking Scheme

S. No	Criteria	Marks
1	Documentation	10
2	Robot Specification	10
3	Construction	10
4	Rules Compilation	10
5	Time	15
6	Task optimization	15
7	Effectiveness of the robot work	Max of 100
8	Logic	20
9	Simplicity of bot	20

- Score will be calculated at the end of the challenge or when time stops.
- Detection of good components without disturbing ' would help to gain 10 points.
- Detection of bad components would gain 20 points.
- Picking up the component would gain 25 points without disturbing.
- Each disturbance would cost a penalty of 25 points.
- Successful completion of the mission would lead to gaining of 100 points.

Drive and Sensor Selection



Factory Layout

Details of the Mat

- Horizontal Dimensions: 2370 mm × 1150 mm.
- A wall that is 16 mm in width surrounds the table. The height of the wall is 50 mm.
- The height of the barrier between the Storage Station area and the field area is 50mm
- The table base color is white, except for the black line, Challenge Object

Areas, Warehouse, and the Base area.

- There are 9 rectangles in the Outer Space area that are 120 mm x 50 mm.
- Three intersections of the black lines in the Warehouse are the places where the good components are set at the beginning of every attempt.

13. Mechatronics

Technical Description

Mechatronics is a branch of engineering that integrates mechanics, electronics, control systems and computer science engineering. Mechatronic system design deals with the integrated and optimal design of a physical system, including sensors, actuators, and electronic components, and its embedded digital control system.

Purpose of the event

Students are expected to design and execute a real time mechatronic system or a production line replica that can be used to partially automate the respective process. The task is complete when the system/production line has been mechanically assembled, correctly wired, connected and its correct operation is guaranteed and executed.

Eligibility Criteria Participant

- Must have SAEINDIA membership
- Must have basic knowledge of mechanics, electronics, control systems and computer science engineering

Expected skills

Tier-1	Tier-2	Tier-3
Principles and applications for; Designing, assembling and commissioning a mechatronic system. The components and functions of hydraulics, electrical and electronic systems, drives, industrial robotics and PLC systems (as used). Design control system for an industrial problem Design pneumatic, electrical and hydraulic circuits	Test and present your actual model	Test and present your actual model

- The individual needs to know and understand the criteria and methods for testing equipment and systems.

Kits and aids expected

The necessary components for the design of the real time mechatronics system are expected to be brought by the individual.

Competition rules

- Actual working model has to be done offline.
- 10 Min PPT presentation at the competition.

Team Size

- Team size: 3

Judging criteria

S. No	Criteria	Marks
1	Rating of the system/production line depending on industry standards	25
2	Judicious usage of components	15
3	Optimizing of the system/production line.	25
4	Technical language associated with the skill	20
5	Quality of report and presentation	15

14. CNC Turning

Introduction

A CNC Lathe is a machine on which material turns around an axis at high speed, and where cutting tools driven by computer software are moved to cutaway excessive material to get the expected part. The CNC Turning Machinist receives the drawing and then steps are decided to manufacture the part.

Objective

To facilitate an event where students can use their engineering drawing reading skills, programming skills and familiarity of CNC lathe machine to successfully manufacture a given engineering part.

Event description

Team needs to understand the given engineering part and program the G and M codes to obtain the tool path. These codes must be virtual validated using the SIEMENS NX CAM software, before they are used in the actual CNC machine.

Expected Skills

Ability to understand engineering drawings and their standards. Knowledge of operational parameters and generation of G and M codes.

Team Size

A team should be composed of a maximum of 3 members.

Competition Rules

All participants should be SAE members. The team will have 15 min to understand the drawings /part.

Program schedule

• Tier-1	Tier-2	Tier-3
tially undergo a viva on the topic of CNC Lathes and G and M codes.	The participants will have 15 minutes initially to understand the given drawing 3 Hrs for GNM coding to be programmed GNM codes will be tested virtually in a Siemens NX Software.	Teams need to test their codes in CNC lathe.

Judging criteria

- Conformity to Drawing.

- Main and secondary dimension .
- Surface Finish and any other as decided by the judge before the start of the event.

Marking scheme

Virtual round (40)

Criteria	Marks
Effectiveness of G and M codes	20
Number of steps	05
Implementation of all the operation	05
Time taken in the simulator	05
Dimensional Accuracy	05
Total	**40**

Criteria	Marks
Conformity to Drawing	20
Dimensional Accuracy	15
Surface Finish	10
Handling of the machine and work surroundings	05
Time taken to complete the work	10
Total	**60**

Final round (CNC) [60]

15. CNC Milling

About CNC milling machines

Computer Numerical Control Milling is a machining process which employs computerized controls and rotating multi-point cutting tools to progressively remove material from the workpiece and produce a custom-designed part or product. Numerical information, generally "G and M codes" (a programming language), is used to control and drive a machine tool i.e. a powered mechanical device ("machining centre").

CNC technology includes machining tools such as lathes, multi-axis spindles, wire electrical discharge machines and milling machines, where the Functions formerly performed by human operators are now performed by a computer control module.

Purpose of the event

The individual will be able to know and understand

1. Programming by hand or CAM system software.
2. Basic material properties and machining properties.
3. Knowledge on M and G codes.

Eligibility Criteria

Must be SAEINDIA membership.

Kits and aids expected

- SAE will provide Raw material on the day of event.
- SAE will provide the facility of the milling machine on the day of event to operate the operations.

Team Size: Maximum 3 per team

Competition Rules.

Start the cutting process using any of the below materials:

1. Solid block 2. Pre-machined part 3. Casting

Perform the following machining operations (as required):

Facing	Through hole boring
Roughing and finishing	Blind hole boring
External contours	Reaming
Milling channels Pocket (figurative)	Tapping
Pocket (circular and rectangular)	Drilling
Taper ribs	Roughing
Thread milling - internal and external	Finishing

Stages of the competition.

• Tier-1	Tier-2	Tier-3
Initially undergo a viva on the topic of CNC milling and G&M codes.	• The participants will get 15 minutes initially to understand the given drawing • 3 Hrs for G&M coding to be programmed • G&M codes will be tested virtually in a Siemens NX Software.	Teams need to test their codes in CNC milling machine.

Judging Criteria and Marking Scheme

S. No.	Criteria	Subjective	Objective	Total
1	Main Dimensions	0	54	54
2	Secondary Dimensions	0	21	21
3	Surface Quality	0	9	9
4	Conformity with the drawing	10	0	10

16. Sheet Metal

Purpose of the event

The competition has been designed to reflect the skills of students ,who are interested in the field of sheet metal stamping. It is open to all streams of Engineering.

Objective:

A problem statement (Relating to Automotive Technology) would be put out by the organizing committee. The student team is expected to come with a possible solution which can be prototyped with the help of sheet metal.

Expected Skills

● Tier-1	Tier-2	Tier-3
Fabrication of given 2D model into a prototype model.	Selected students will have to convert their 2D model into a prototype model. Fabrication can be done using manual rolling, folding, bending and shaping equipment which will be provided. Check using gauges, Vernier calipers, rules, squares; which will be provided.	Construct assemblies by appropriate techniques. Riveting operation & Adhesives can be used to join the sheet metals to form the assembly. Proper polishing, finishing and painting should be ensured.

Kits and aids expected

SAEISS will provide the raw materials. Any other thing that may be needed may be brought by the team members.

Team Size

- Maximum of 3 members

Competition rules

Teams will have to submit sheet metal design part drawings.
Shortlisted teams will have to do sheet metal process plan, as part of the fabrication and assembly stage.

Judging Criteria

S No		Marks
1	Pattern Drawing	30
2	Fabrication	20
3	Assembly and Fit up	40
4	Appearance, Finish & Explanation	10

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17. Manufacturing/Tech Challenge

Purpose of the event

To provide an opportunity for college students to plan and implement a manufacturing setup, which includes practice of interpersonal skills, communication, work management, cost reduction and planning of a process.

Event Description

Event covers designing (CAD & CAM) and manufacturing (CNC milling & lathe) equipment assemblies with project documentation, implementation of cost reduction and sequence of process.

Eligibility Criteria participants

- Must have basic knowledge on manufacturing
- Must have basic CAD and CAM software knowledge

Expected skills

• Tier-1	Tier-2	Tier-3
Prepare the full manufacturing process of given parts	To interpret drawings that conform to ISO standards Create and modify 2D and 3D models. Create CNC programs using CAM packages and appropriate postprocessors. Complete drawing activities within the planned timetable and to suit the project's overall requirements	Machine components to drawings on conventional machine tools and from CAM generated tool paths. Safely operate a CNC machine. Manufacture components to industry finishes and tolerances, Measure and adjust manufacturing process to meet specifications

Kits and aids expected

- Creo , CATIA, SolidWorks or any CAD system.

Event Stages.

- Providing solution for the given problem
- Portfolio and PPT Presentation
- Generate tool path simulation using CAM software

Team Size

A team must consist of 3members of complementary specialist.

Judging criteria and Marking Scheme

Criteria	Marks
Design and Modelling	20
Portfolio/Documentation	20
Manufacturing/Process Design	20
Standardization of machining process	20
Evaluation/Presentation	20

18. Mechanical Computer Aided Design (MCAD)

Introduction

Mechanical Engineering Design covers the use of Computer Aided Design (CAD) technology in the preparation of graphical models, drawings, paperwork and files containing all the information necessary for manufacture and documentation of parts and components typical of solutions to mechanical engineering problems facing workers in industry. It's an opportunity for young student designers to learn industry design skills who are willing to pursue their career in the field of design.

Purpose of the event

- The scope of work includes Design, create 3D models and create 2D drawings including material specs, manufacturing process, GD & T etc.

Expected Skills

- Knowledge and understanding of 3D modeling of part.
- Knowledge of any CAD software.
- Knowledge / awareness in creating 2D manufacturing drawings.

Tire-1	Tire-2	Tire-3
create sketches of given part model on paper. information to assist with measurement process. Measuring accuracy = ±0.2 mm across machined surfaces. Measuring accuracy = ±0.5 mm across unfinished surfaces. Radii and chamfers > 0.4 mm not required. Neglect any surface irregularities. 1.5-degree draft angle where required. Review the provided sketches for dimensions.	Create the model of the part using 2D drawings ,	Create required views to display the major features of the part. Create a detailed drawing of the part. All annotation styles must meet ISO standards. Dimension as required for manufacturing. All main parts are to be included in the drawings Dimensions should be placed using one decimal place. Apply GDT Add a note listing the volume of the part in mm3. Provide a rendered image as appropriate

Kits and aids expected

- All Competitors must review the given question from industry experts' access and understand it and model the part. Understanding of GD&T is needed.

Team Size :

Maximum of 3 members

19. Electronics

Introduction

Traditionally automobiles had majority of mechanical parts assembly, but now-a-days thirty to forty percent of vehicle assembly consists of Electronic parts. This event stresses the importance of electronics to the students of mechanical and automobile field and in the other way attract the students of electrical and electronics to the automotive sectors.

Eligibility Criteria

Participants

- Must have SAEINDIA membership
- Must have basic knowledge on programming and circuit design.

Event details

• Tier-1	Tier-2	Tier-3
Explaining the functioning of components used in their own circuit. Finding faults in the given basic circuit.	Writing an algorithm to the electronic circuit. Writing the program to the electronic circuit. Test your model.	Assembling the components. Demonstrating the working unit.

Kits and aids expected

Students should bring the required components for their own electronic circuits. Only circuits for fault finding will be provided.

Competition rules

Programming could be done using MATLAB/SCADA.
Evaluation by the judges will be final in all regards

Team Size

Maximum 3 per team.

Judging criteria and Marking Scheme

Criteria	Marks
Finding faulty spots and evidence	15
Repairing	15
Software functionality	25
Check for operating condition	20
Assembly according to quality	25

Note: Economically feasible electronic circuits will be encouraged. So it could be taken to the next stage of production.

20.Group Discussion Competition

The concept

The students will be divided into groups on the spot and will be given a situation to solve by discussing it with their fellow teammates.

Topic

On the spot topics of general social importance / situation / event / theme will be given.

Expected skills

Tier-1 Tier-2 Tier-3
Knowledge on current affairs and events. Time management and team role playing. Good Communication and paraphrasing / summarizing skills. Listening, public speaking and social engagement skills.

Competition rules

- Each group will be given 10 minutes
- Decision of the judges will be final in all regards.

Team size

Best 3 participants in college level will be selected to Tier II
Best 3 participants in Tier II (irrespective of college) will be selected to Tier III
Best 3 participants in Tier III (irrespective of college) will be selected as winners

Judging criteria

Evaluation may be for group / individual

- Knowledge of the topic given
- Communication and presentation skills
- Problem solving
- Reasoning and observation skills

- Leadership quality
- Body language
- Group behaviour

21. Vehicle Weight Management Design

Purpose of the event

- Proposal on good working ideas of proposed vehicle and formulating presentation regarding the same.

Kits and aids expected

- Things needed for a presentation.

Competition rules

• Tier-1	Tier-2	Tier-3
Weight distribution calculation of different types of vehicles. Analytical calculations	Vehicle weight optimization using MATLAB For racing cars.	Modeling the full assembly of the vehicle for safe running in different terrain and speeds using dynamic modeling software's like MSC ADAMS

- 15 minutes will be provided to present their design.
- 10 minutes for questions and answers.

Team Size :

- Maximum of 3 members per Team.

Judging Criteria

Presentation shall be evaluated by the Judges on criteria mentioned below.

1. Design justification.
2. Technical merit.
3. Value proposition cost, usage, implication on society.
4. Presentation delivery and effectiveness.

22. Diagrammatic Reasoning

The concept

Students shall understand the terms in the diagram relating to engineering and choose the answer appropriately. The students are advised to visit the following links to on how to approach diagrammatic reasoning and questions based on Venn diagrams.

http://www.savilleconsulting.co.za/wp-content/uploads/2012/08/preparation-guide- diagrammatic-reasoning.pdf

http://www.indiabix.com/verbal-reasoning/venn-diagrams/

Purpose of the event

To get an exposure for attending the aptitudes in the interviews and understanding the engineering processes in a simple way.

Eligibility Criteria

The individual,

- Must have SAEINDIA membership.
- Must have knowledge on Engineering drawing.

Kits and aids expected

Not applicable.

Competition rules

Tier-1 Tier-2 Tier-3
All the questions will be related to engineering field. The event will take place in 3 levels and number of teams will be filtered depending upon the total number of registrations we get. The level of difficulty will increase in each level. Number of questions, question type and time limit will be announced during the event. The students must be prepared in all curriculum subjects, their applications and should possess logical thinking.

Team Size

Maximum of 3 students.

23. How things work

The concept

Understanding the given part and assembly. To understand every feature associated with its function.

Eligibility Criteria participants

- Must have SAEINDIA membership.
- Must have knowledge about automotive parts and assembly.

Expected skills

• Tier-1	Tier-2	Tier-3
To identify the mechanism behind the given component/assembly. Written test of basic mechanisms.	Develop the mechanism in any modeling software.	Make the mechanism using provided materials Practical presentation round. (To explain the given components function and to make the component to perform the mechanism)

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Kits and aids expected

Kits or aids are provided for the competition.

Marking Scheme

Content	Marks Allotted
Round 1 MCQ	30
Round 2 General and Visual round	40
Round 3 Demonstration of the use/functionality of the part/assembly	30
Total	100

Team Size : 3 members per team.

24. Manufacturing Process Planning

The concept

To make a detailed plan to complete a manufacturing operation in the least amount of time at the lowest cost.

Introduction

Manufacturing Process Planning is a necessary skill where the focus is to complete a job at the lowest cost. It involves Manufacturing planning, process planning, material processing, process engineering, and machine routing and preparation of work instructions sheet.

Expected skills

- Basic manufacturing technologies and operations knowledge.
- Knowledge of computer aided process planning software.

• Tier-1	Tier-2	Tier-3
MCQ related to manufacturing technology and operations	To determine the fastest and most economical way to produce the part. In case of more number of participants clearing the process planning	Optimizing the process for manufacturing a product using NX Process planning software

Kits and aids expected

- Participants would be provided with Part Planner software or NX Process planning software.

Team Size:

3 per team.

Judging Criteria and Marking Scheme

Minimum no of process activity,
Use of appropriate methods and least time.
Weightage shall be decided by the judges.

25. Material Identification

Concept

Identify the material of the given product or components in automobiles. This competition reflects a range of materials skills used across quality department in various automotive industries.

Alignment with curriculum

- Identify the material of components.
- Description of material and their properties.
- Describe the use of that material.

• Tier-1	Tier-2	Tier-3
Participants are questioned and analyzed based on their knowledge regarding the basics of material properties usage and their composition.	Each team should identify the material of components which will be providing on clearing the prelims and write the description of material. The team must present their conclusion in front of the jury.	Choose proper materials to perform a specific function in a machine component. Identify the different material is a big assembly of parts Example: Train bogie, Machine tools, Optimize the material usage and proper choice using any software.

Kits and aids

- Component will be provided for teams clearing the prelims.

Teams size: 3 members

- Teams clearing the prelims are promoted to final round.
- The teams should be able to find out material of given component within the given time.
- Based on the presentation, identification and time taken teams are to be evaluated.

26. Oil Seal Design

Purpose of the event

To design an oil-seal for a rotating shaft in an automobile.

Eligibility Criteria

Candidates who hold/ pursuing a degree in Mechanical/Automobile Engineering are eligible to take part in the event.

Kits and aids expected

• Tier-1	Tier-2	Tier-3
General questions (Written test) on oil-seal design and its applications in day-to-day life will be asked. The candidates are also asked to create a 2D drawing. Top teams with maximum scores will enter the Final Round.	Use of CAD system is required to present their design	The candidates are required to perform FEA analysis in addition to 3D modelling. The design must show displacement and stresses of the oil seal, along with contact forces of the oil seal to prevent leakage.

Team Size

- Maximum of 3 Team members

Competition rules

- CAD and analysis may be done offline.
- The candidates are given a time of 30 mines to present their design.

Event Outcome

- The designing talent of the candidates is enhanced.
- Knowledge about various types of oil-seal design is gained.
- The practical applications of the Oil-Seal are known.

27. Reverse engineering

Purpose of the Event

To make a duplicate model of an object using reverse engineering process.

Eligibility Criteria

1st have basic knowledge to understand the 2D drawing and 3D modeling

Expected skills

tier 1	Tier 2	Tier 3
Each team should write about the given part i.e. The materials used manufacturing process/method.	Prepare 3D CAD model of the physical part. Vernier calipers or other measuring devices take measurements.	Prepare 2D drawing of the given part Prepare a duplicate of the part using available alternative material

Kits and aid expected

Non-Consumable materials, equipment and tools should be supplied by the organizer. Consumables may be provided on prior information. Some that are available are

Newspapers and Thermocol, Adhesives such as tapes, glue sticks, pins etc. Cutting tools such as scissors, blades.

Competition rules

- The team is independent of selecting the object.
- The team can use any software for preparing the 3D model.

Team size: maximum 3- team.

Judging criteria Marking scheme

Content	Marks Allotted
Write up	15
Accuracy of 3D model	15
Time taken for 3d model.	10
Complexity of the object selected.	10
2D Drawing of the give object	20
Duplicate object	30
TOTAL	100

28. Threading and Taper turning

Purpose of the event:

The main objective of the event is to make the students to understand the practical difficulties in basic screw threading and taper turning operations.

Eligibility:

Participants should have basic knowledge about lathe, steps and methods in threading and taper turning operations

Event rules:

Tier 1	Tier 2	Tier 3
Participating students should able to clear the prelims within the specified time. Difficulty level will be decided based on the performance of the students in the Preliminary level		

Kits and Aids expected

All items required to carry out the above activity shall be provided

Responsibilities of participating teams:

Safety shoes are mandatory.

Students should wear dresses as appropriate for a workshop.

Any stationary that may be required shall be brought by participants.

Team Size: 1 or 2 members

Judging criteria:

Marks for each team will be awarded by an expert based on the accuracy, perfection and time taken to complete the event. Also marks will be awarded on Selection of different methods and steps in the process

29. Work Holding

Purpose of the event

To fabricate a work holding fixture based on basic concepts of holding devices.

Expected Skills

- Fabrication techniques.
- Knowledge about the construction materials and physical properties.
- Concepts of strength of materials to test the specimen.

Kits and Aids expected

Dresses appropriate for safe working of the Workshop.
They should bring the necessary stationary or any other items.
Basic theoretical and operational knowledge about machinery.

Competition rules

tier 1	Tier 2	Tier 3
ve of the event is to make the students to understand the practical difficulties in basic work holding devices especially in Four Jaw Chuck. ent work holding devices in machine shop.	Hold the work in shaper ,slotting, Grinding machines Hold the rectangular work on 4 jaw chuck of lathe in given time.	Holding the different shaped work (other than rectangular) in 4 Jaw chuck, Shaper ,slotting and grinding machine.

To increase the difficulty level, students can be made to face the sides of the rectangular workpiece or to drill the work piece at the specified point to the given depth.

Team Size: 1-2members

Judging Criteria

- Accuracy and time taken to complete the fixing holder design event as
- decided before the start of the event.

30. Internet of Things

Introduction

Automotive Manufacturers are leveraging their interest in IoT related to automotive. There is a growing trend and huge business opportunity in connected cars. Currently, automakers are connecting their vehicles in two ways: embedded and tethered. Embedded cars use a built-in antenna and chipset, while tethered connections use hardware to allow drivers to connect to their cars via their smartphones.

Objective

The purpose of the event is to propose innovative ideas and develop prototype for an IoT based system that can make a smart connected car. The student selects a topic, collects information and presents a synopsis or abstract.

Expected skills

Tier -1	Tier -2	Tier -3
Proposal submission and detailed presentation.	Good Knowledge on the various functionalities of the system and present a functional prototype	Participant must give a detailed presentation along with the final demo of the system with a working prototype.

Competition rules

Paper should be submitted one week ahead of the competition date. Presentation can be for 7-minute presentation and 3-minute question and answer. The team must develop an application based on the proposal submitted .Application can be developed on any platform compatible for either Android or IOS and the final Apk file must be submitted.

Team Size Maximum 3 members per team.

Judging Criteria

Tier -1	Tier -2	Tier -3
70% for quality for paper Criteria: according to the SAE International and Novelty of the Proposal 30% for presentation Criteria: quality of slides, clarity of presentation and confidence in answering queries Data collection.	Evaluation of the prototype based on stated proposal & feature functionality	80% for the completion and successful demo of the functionality in match with the proposal. 20% for the Presentation and scope for future enhancement

31. 3D Printing

Introduction

- 3D printing is an additive Manufacturing technology were digital 3D design data is used to build up a component in layers by depositing material. It uses a technology known as FDM (Fused Deposition Modelling) or FFF (Fused Filament Fabrication). There are other methods like laser sintering, DLP, etc. This is considered a future manufacturing technology and hence awareness in this technology.

Objective

- Any component to be 3D printed is scanned and morphed in the computer with 3D CAD modelling and then printed by a 3D printer.

Expected Skills

- Planning and 3D Slicing creation of a CAD model, generating the G-codes, 3D printing the same in an FDM based 3D printer post processing the 3D printed part such as removing the supports.

Tier -1	Tier -2	Tier -3
ıting ɔn traditional manufacturing process. printing technology.	odel of the part provided which has to be modeled by the participants in any CAD software and exported to .stl file, and sliced using "Cura" (slicing software). done in an efficient way with minimal supports, minimal printing time, and maximum print quality and the .g code should be created for the 3D printer	.g code file without flaws. Post process the printed part like removing the supports and finishing the part.

Kits / aids

- Laptops with the required CAD software shall be brought by participants.
- 3D printers and filaments will be provided at the event

- Slicing software Cura installation file will also be provided at the event.
- All other kits and aids will be provided.
- Participants should submit a report on the model they developed and they will go through a viva with the judge.

Team Size 3 Students

Judging Criteria / Scoring Marks

S.No	Criterion	Marks
1	3D Printing time	25
2	Minimal Support	25
3	Stability of the product	10
4	General look & finish of the product	10
5	Report content	10
6	Question & Answer	20
Total marks		**100**

32. Bridge Building

Purpose of the event

- To fabricate a bridge based on basic concepts of a bridge.

Expected Skills

- Fabrication techniques.
- Knowledge about the construction materials, physical and structural properties
- Concepts of strength of materials, testing and failure mechanism.

Competition rules

Tier -1	Tier-2	Tier-3
A set of 25 questions will be given to every team and 30 minutes is allotted for solving it. Best of 10 teams will move to the next round.	Construction of a bridge By using soft tool (West Point Bridge Design)	Construction of a bridge Prototype model using given materials. Testing to check its viability

Kits and Aids

All the necessary materials to create a model of a bridge will be provided.

Team Size 2-3 students

Judging Criteria

S.No	Criterion	Marks
1	Construction Technique and quality	15
2	Creativity & Aesthetics	15
3	Engineering analysis	30
4	Strength to weight ratio	40
Total marks		100

33. Ethical Hacking

Introduction

As cars become more connected to the Internet and cellular networks, auto manufacturers are quickly learning the need to engage ethical hackers to better understand the vulnerabilities of their cars. Ethical Hacking for Vehicles includes a range of tests targeted at the "attack surfaces" of the vehicle along with the vulnerabilities of the security attack through the cyber world.

Purpose of the Event

The purpose of the event is to propose and create innovative system/solution that leverages the various possibilities of security attack and hacking of the auto system from the outside world.

Expected skills

Tier-1	Tier-2	Tier-3
Proposal submission and presentation.	Good Knowledge on the various functionalities in the App and execute few of them	Participant must give a detailed presentation along with the final demo of the app along with documentation.

Competition rules

- Paper should be submitted one week ahead of the competition date.
- 7 minutes for presentation and 3 minutes for questions and answers.

Team size : 3 members

- Number teams for Tier-1: as much as possible
- One team from each college moves to Tier-2 (division level).
- Two teams from each division moves to Tier-3 (convention)

Judging criteria & Marketing scheme

Tier-1	Tier-2	Tier-3
70% for quality for paper Criteria: according to the SAE International and Novelty of the Proposal 30% for presentation Criteria: quality of slides, clarity of presentation and confidence in answering queries Data collection.	Testing and analysing the ideas	80% for the completion and successful demo of the functionality in match with the proposal. 20% for the Presentation and scope for future enhancement

34. Big Data

About

Automakers are ramping up their connected car efforts for several reasons. Internet connectivity in vehicles allows car companies to release software updates in real time. Automotive companies can use data from the car to analyze its performance and obtain valuable data on how drivers use their cars. Real-world vehicle performance will both influence and benefit from Big Data. Information gathered from the field from vehicle systems, driver inputs and external conditions will exert a major influence over the design of components and the characteristics of future vehicles.

Purpose of the event:

The purpose of the event is to propose and create innovative system that can gather data throughout the life cycle of the vehicle so that auto manufacturers can use the data to shape future vehicle designs. Every part of the vehicle can be tweaked and tuned. Real-world data collected from billions of miles driven will undoubtedly influence safety, aerodynamics, performance, power algorithms and other fundamental elements of the vehicle.

Expectations:

Tier-1	Tier-2	Tier-3
Proposal submission and presentation.	Good Knowledge on the various functionalities of the system and possibly execute few of them	Participant must give a detailed presentation along with the final demo of the system along with documentation.

Competition rules:

- Paper should be submitted one week ahead of the competition date.

Presentation in competition:

- 7-minute presentation.
- 3-minute question and answer.

The team must develop an application based on the proposal submitted.

Teams:

Team size: 2-3 students

- Number teams for Tier-1: as much as possible
- One team from each college moves to Tier-2 (division level).
- Two teams from each division move to Tier-3(convention).

Judging criteria:

Tier-1	Tier-2	Tier-3
70% for quality for paper Criteria: according to the SAE International and Novelty of the Proposal 30% for presentation Criteria: quality of slides, clarity of presentation and confidence in answering queries Data collection.	Showing the functions and testing them in front of judges	80% for the completion and successful demo of the functionality in match with the proposal. 20% for the Presentation and scope for future enhancement

35. Mobile App Development

Introduction

Uses of mobile enterprise solutions in the automotive industry are numerous. The capability of smart phones and the cost effectiveness of the mobile apps available in the automotive sector have made the automobile industry look for better options that would provide users with hands free experience while driving.

Purpose of the Event

The purpose of the event is to propose and create innovative mobile app for automotive sector according to the latest automotive market standards, that are also customizable mobile apps. Apart from the design, security and distribution are to be addressed during the development of the apps.

Expected skills

Tier-1	Tier-2	Tier-3
Proposal submission and presentation.	Good Knowledge on the various functionalities in the App and execute a few of them.	Participant must give a detailed presentation along with the final demo of the app along with documentation.

Competition rules

Paper should be submitted one week ahead of the competition date.
Presentation in 10 mines including Q & A.
Apps should be based on the proposal submitted.
Application can be developed on any platform compatible to Android or IOS
Final Apk file must be submitted.

Number teams for Tier-1: as much as possible
One team from each college moves to Tier-2 (division level).
Two teams from each division moves to Tier-3 (convention).

Team size: maximum of 3 members

Judging criteria & Marking scheme

Tier-1	Tier-2	Tier-3
70% for quality for paper Criteria: according to the SAE International and Novelty of the Proposal 30% for presentation Criteria: quality of slides, clarity of presentation and confidence in answering queries Data collection.	30% for UI design, 40% for basic functionality test and 30% for presentation.	80% for the completion and successful demo of the functionality in match with the proposal. 20% for the Presentation and scope for future enhancement. Any additional criteria may be decided by the judge before the start of the event.

36. Circuit Design

Purpose of the event

- To Enhance the Knowledge on Basic Circuit Design with respect to the Industrial Application.

Expected Skills

- Basic knowledge about circuit designing.

Tier 1	Tier 2	Tier 3
A set of 25 questions will be given to every team and 30 minutes is allotted for solving it.	A schematic circuit (including some questions) will be given to every team with specifications.	Each team will be given a sheet, where source and output of the circuit will be given.
Best of 10 teams will be selected for the Next Round	Teams should identify the circuit and write its application.	Teams should quickly design a circuit and they must obtain the output.

Competition Rules

- Team size: 3 students.
- Kit shall be provided at the time of event.
- No electronic devices are allowed during the time of event.
- Contestants must be an SAE member.

Team Size Maximum 3 members per team

Judging Criteria for final round

Sl.No	Criterion	Marks
1	Knowledge about circuit	25
2	Product designing / specs	10
3	Accuracy of output	40
4	Number of components used	25
Total marks		**100**

Note: Any other details about marks can be had from the judges before the start of the event.

37. Human Powered Vehicle

Introduction

- The competition encourages and promotes the teams to design and fabricate energy efficient human powered three wheeled vehicles. The design should be aesthetically appealing with decent performance, reliability and ease of operation.

Purpose of the event

- The main purpose of this competition is to provide an opportunity for SAE student members to design and fabricate eco-friendly vehicle and come up with innovative designs. To provide direct hands-on experience to the students on the real time manufacturing of a vehicle.

Competition Summary

- The competition includes designing, fabricating and validating a three wheeled vehicle driven by a single driver. The vehicle should be able to run only in human power. The vehicle would be evaluated for its design, fabrication quality, and performance.

Vehicle configuration

- The vehicle must have three wheels that should not be in a straight line. The team must design a vehicle only in **Delta (1F2R)** configuration. The vehicle must be capable of carrying one Driver of maximum weight 100kg. The vehicle can be fabricated in any alloy material. Drivers Safety is an important factor to be considered while designing the vehicle.

Team Size

- Maximum 3 members per team

Kits and Aids expected

- Teams will be provided with tools and steel tubes by SAEISS for fabrication.
- Paint brushes and any other painting essentials must be brought by the participants.
- Any other things required for prototype must be brought by teams or mutually agreed with SAEISS for ensuring their availability during the

competition.

Event Structure:

Tier 1	Tier 2	Tier 3
Preliminary test based on vehicle dynamics. Design calculation of given vehicle problem.	Vehicle design must be done in CAD software and complete design must be presented. Presentation can contain pictures, simulation, animation for better explanation with a maximum of 15 slides. Presentation must contain layout specification of the vehicle and its aggregate like steering system, braking system, power train, material used, ergonomics and safety of the vehicle, etc.	Shortlisted teams must do a prototype of their design. Teams will have to work upon the kits and aids provided and they can use their own painting essentials as well. Riveting and adhesives can be used to join the steel tubes to form the assembly. Proper polishing, finishing and painting should be ensured for an aesthetic feel.
Design roll cage for the given problem.	Submit detailed design report of your vehicle. Based on the effectiveness of the presentation best team would be shortlisted for the finals (Tier 3).	Teams should also explain how their design can be used in the market and should also speak about the advantages of their design. Questions and answers will be asked by the judges and all the team members should be capable of answering it.

Preliminary Assessment Criteria

Sl.No	Criterion	Marks
1	Vehicle design	30
2	Technical Specifications	40

3	Explanation	30
Total marks		**100**

Final Assessment Criteria

Sl.No	Criterion	Marks
1	Vehicle Design	30
2	Finish and Appearance	15
3	Vehicle Demonstration	25
4	Marketing Strategies	15
5	Question and answers	15
Total marks		**100**

NOTE: Judges will do the assessment and will be verified by the SAEISS Organizing Committee.

38. On-Board Diagnostics

Introduction of the Event

- On-Board Diagnostics (OBD) is an automotive term referred to a vehicle's self-diagnostic and reporting capability which monitors component that affect the emission, performance of a vehicle and alerts the vehicle operator when a malfunction is detected via a malfunction indicator light. It stores information, including a diagnostic trouble code (DTC), about the detected malfunction to aid a repair technician in accurately finding and fixing the problem.

Eligibility Criteria

- Candidates pursuing their degree in Mechanical/Automobile Engineering are eligible to take part in the event.

Expected Skills

- The team should have good knowledge on On-Board Diagnostics followed by errors that are usually detected by an OBD reader before attending the competition.

Kits and Aids Provided

- Car having the OBD facility will be provided.
- An OBD reader.
- Diagnostic trouble code sheet.

Competition Rules

- Participants should be an SAE Member.
- Only 2 members per team will be permitted.

Team Size Maximum 2 members per team

Overall Event Format:

Tier 1	Tier 2	Tier 3
Written test based on automobiles will be asked.	OBD hardware specification Standards for different manufactures. OBD-II diagnostic connector specifications and color codes.	A car with some sort of malfunction in the Engine will be provided. Plug the OBD reader in the computer which is present in the car. Note down the error code which is displayed in the OBD reader.
Winners will be selected for Tier 2	Develop diagnostic trouble codes for given problem	Find out the error for the code using Diagnostic trouble code sheet and rectify the same. And finally reset the OBD reader and explain the errors that occurred in engine to the judges.

Judging Criterion

- The team that quickly spots out the error using OBD reader, fixes it and explains the error to the judges will be considered as the winner.
- The judges will give weightage based on timings / quality and resolution quality of error.

NOTE: Make sure that after rectifying and resetting the OBD reader the Malfunction Indicator Light should turn off.

39. Lightweight Mobility Vehicle

Purpose of the event

- Designing, prototyping, fabricating a lightweight portable mobility vehicle.

Expected Skills

- Design sketching.
- Fabrication techniques.
- Appreciation of materials and their properties.
- Concepts of automotive and transmission systems.

Kits and Aids

- PVC pipes and fittings for prototyping will be provided for teams clearing the prelims.

Event Blueprint

Tier 1	Tier 2	Tier 3
Participants are questioned and analyzed based on their knowledge regarding the basics of automotive especially mobility vehicles and then they are sent to the next stage.	Each team must make a prototype of their design using PVC pipes and fittings provided on clearing the prelims. Design, prototype and related calculations needs to be presented.	Teams should fabricate their mobility vehicle and that will be compared to the vehicles fabricated by other teams. Submit detailed design report of your vehicle including dynamic analysis, FEA

Competition Rules

- If more than one team registers, only one of them will be selected during prelims based on their performance.
- The teams should be able to fabricate the prototype as well as the vehicle within the given time. No extra time or material will be provided in case of wastage.
- The fabricated vehicle should not vary in any aspects from the models presented by the teams in the preceding rounds.

Team Size maximum 3 members per team.

40. Biomimicry

Purpose of the event

- Students can pick up any natural organism and modify an existing technology or introduce a new technology by taking any property of the selected organism.

Eligibility criteria

- Participants must have SAEINDIA membership
- Must have ability to prepare a mini prototype models
- Capable of identifying the problem and alternatives to that of the organism

Expected skills

- Identify the peculiarity of the organism and explain how it can reduce human effort or how it can modify an existing technology
- To prepare a mini prototype of the newly designed or modified structure

Kits and aids expected

- None

Team Size

- Team size: 3 students

Judging criteria and Marking schemes

Tier-1	Tier-2	Tier-3
Identifying the feature or a characteristic of the organism	Develop a new Technology or concept using mimicking of given Organism.	Mini prototype of the newly designed and modified structure. Presentation.

41. Digital Manufacturing

Purpose of the event

Digital manufacturing is an integrated approach to manufacturing that is centered around a computer system. The transition to digital manufacturing has become more popular with the rise in the quantity and quality of computer systems in manufacturing plants. As more automated tools have become used in manufacturing plants it has become necessary to model, simulate, and analyze all of the machines, tooling, and input materials in order to optimize the manufacturing process. Overall, digital manufacturing can be seen sharing the same goals as computer-integrated manufacturing (CIM), flexible manufacturing, lean manufacturing, and design for manufacturability (DFM). The main difference is that digital manufacturing was evolved for use in the computerized world.

Expected Skills

Tier 1	Tier 2	Tier 3
A preliminary round (technical quiz written test) to shortlist teams, the test will be an MCQ testing the knowledge of the participants in the field of direct digital manufacturing.	perform presentation on “Advances in Direct Digital Manufacturing”	Prototype a given problem using any digital manufacturing methods.

Kits and aids

Rapid prototyping machines
Computer with appropriate software’s like NX Siemens

Team Size : Maximum of 3 Team members

Judging Criteria

S.No	Criterion	Marks
1	Content	25
2	Innovativeness in your ideas	40
3	Presentation skills	20
4	Question & Answer	15
Total marks		**100**

42. Design of Parts and Assembly

Purpose of the event

- This event tests the ability of the students to assemble different mechanical components and parts.

Description

- Each student has to assemble the parts of the given automotive component and the kinematic simulation has to be done.

Criteria

- Participants must have SAEINDIA membership
- Students participating in this event should have design knowledge of general mechanical components and have skills to model in software like NX SIEMENS,
  Solid works, Catia etc. check on the availability of the above software with SAEISS

Expected skills

Tier-1	Tier-2	Tier-3
A set of 25 questions will be given to every team and 30 minutes is allotted for solving it.	Design calculation for the given Automotive component like shaft, axle, bearings, gears drives etc.has to be done.	Model the Component as per the Designed calculation in previous Round. Assemble the Component. Kinematic simulation has to be done.

Kits and aids expected

- Around 20 to 30 computers having designing software (NX SIEMENS preferably).

Size 3 members per team

Judging criteria

- Whoever finishes the functional assembly in the least time would be considered the winner and simulation is required to test the function of the assembly.

Tier-1	Tier-2	Tier-3
Best 1 team will shortlist to next round	Formula used Design procedure and design parameters for building and assembly.	Dimensions of Parts Assembly constraints and duration for assembly of functionality.

43. Engineering Drawing

Objective

- Graphical representation makes it easy to understand and interpret data at a glance. Drawing is the oldest and efficient way to put data in simpler terms. Engineering is all about planning and implementing and no planning is perfect without a schematic representation.

Required Skills

- Engineering graphics Knowledge.

Team Size

- Maximum 3 members per team.

Tier-1	Tier-2	Tier-3
20 Prelims questions.	Given diagram or part shall be detailed in the given format. Standards used in drawing.	Component given and participants detailed in the drawing. Draw any projections and sections given in the problem.

Competition Rules

- Proper folding of sheets.
- Use of pencils for required purpose.
- Use chain dimensioning and mark the dimensions outside of the view.
- Use Title block, scale.
- Layout with all views.
- Material data.
- Machine detailing if applicable.
- Any specific instructions.

Judging Criteria

- 2H pencil for dimensioning.
- Proper arrow size.
- Chain dimensioning and marking the dimensioning outside of the diagram.
- A3 sheet folding (125/105/190).

44. Six Sigma

Concept

- To understand the lean concepts & six sigma methodology and techniques

Purpose of the event

- This event gives an overview of six sigma technique.
- Understand business processes and to improve them for time management / strategic planning and focus

Eligibility criteria

- Participants must have SAEINDIA membership
- Must have knowledge in Six sigma methodology
- Must have good Communication skills

Expected skills

Tier-1	Tier-2	Tier 3
Good knowledge in six sigma collection	Good depth of data Interpretation Correlation of data collected from different sources	Identification and interpretation of industrial problem

Competition rules

Tier-1	Tier-2	Tier 3
25 questions to be answered in 15 minutes. Best of 8 teams will move to the next round.	Case study with incorrect data will be given, you should present the case, using Lean Concepts or Six Sigma Methodology. Use one quality tool and explain where you would use it and why	Optimize the manufacturing industry process and products using six sigma methods

Kits and Aids expected

- None

Team size

- Team size: 3 students
- Number of teams for Tier-1: as many as possible

Judging criteria

Tier-1	Tier-2	Tier 3
Quality of function analysis. Team with the highest score would go to the next level.	Based on the most effective solution for the given data and for the error analysis	Methods choosing and time for solving

45. Engineering Problem Solving

Purpose of the Event:

- An industrial or a day to day problem will be given for which solutions have to be found. The problem will be associated to mechanical/ electronics field of applications.

Expected skills

- Identify the existing problem that can be related to industry and day to day engineering problems
- Prepare a mini prototype of the newly designed or modified structure.

Competition rules

- Prelims will be conducted and from which 5 teams will be selected for the final round.

Tier-1	Tier-2	Tier 3
Propose a design for a given problem	3D Modeling using cad software for a given industrial problem solution. Analytical calculations.	Numerically test the model in MATLAB and Optimize it.

Team Size : Team size: 3 per team

Judging criteria& Marking scheme

- Industry Related Problem-10%
- Changes made-70%
  - Concept
  - Cost
  - Efficiency
  - Maintenance
- Time taken for Solving-20%

Points to be considered while solving

- To what level the solution will change the current system
- Cost
- Availability of material
- Efficiency of the operation and related maintenance.

46. Geometric Dimensions & Tolerance

Purpose of the Event

Participants are expected to answer questions based on Geometric Dimensions and Tolerance

Expected skills

Tier1	Tier2	Tier 3
The participant has to know G D&T symbols extensively	The participant has to be able to solve problems based on G D&T	Standards used in G D&T Symbols for given process and product. Draw detailed working drawing for a product.

Kits and aid expected

None

Competition rules

- Only one answer per question is allowed
- Each question carries 1 mark
- For Round Two, the entry will only be entertained if the symbols are legible.
- No negative marking
- Use of guides in any form (electronic or paper) is prohibited.

Team size

- 3 students per team
- No limitations for number of teams in round one
  The winner will be chosen according to the number of right questions answered

47. Benchmarking

Purpose of the event

- To make a detailed study about the rules and the terms which are followed in the manufacturing industries. To understand the terms and their function along with job & responsibility.
- Benchmarking is the process of analyzing the terms and the standards of a company which they follow and to compare it with the standards to be followed.

Expected Skills

Tier1	Tier2	Tier 3
The participants of this event need to analyze the standards which are being followed and what actually should be followed	Benchmark real industrial product	Using Optimization tools for benchmarking a product

Participation Pre-Requisite

- Basic knowledge on internet browsing.
- Preparation of powerpoint presentation.

Team Size

Maximum 3 members per team

Event rules

- All the questions will be related to manufacturing industries.
- The event will take place in 2 levels and number of teams will be filtered depending upon the total number of registrations.
- Name of the industry, time limit and the process of the event will be announced at the time of event.
- The students should be aware of the work processes and standards followed in the industry

Judging criteria: The teams should be judged on their understanding of the concept of benchmarking. The use of standard terms, their explanation, industrial standards etc. should be given consideration while judging

48. Jet Toy - Manipulator

Purpose of the Event:

Student design teams will construct a Jet Toy car that can travel a specific distance.

Eligibility Criteria

Must have basic knowledge on aerodynamics.
Must have basic knowledge on Design software to be used.

Kits and aid expected

The kit required for making the toy will be provided by the event organizers.

Separate pits will be provided for each team by event organizers.

Fresh Print out of the Manual available in website may be carried by the team.

Competition Rules

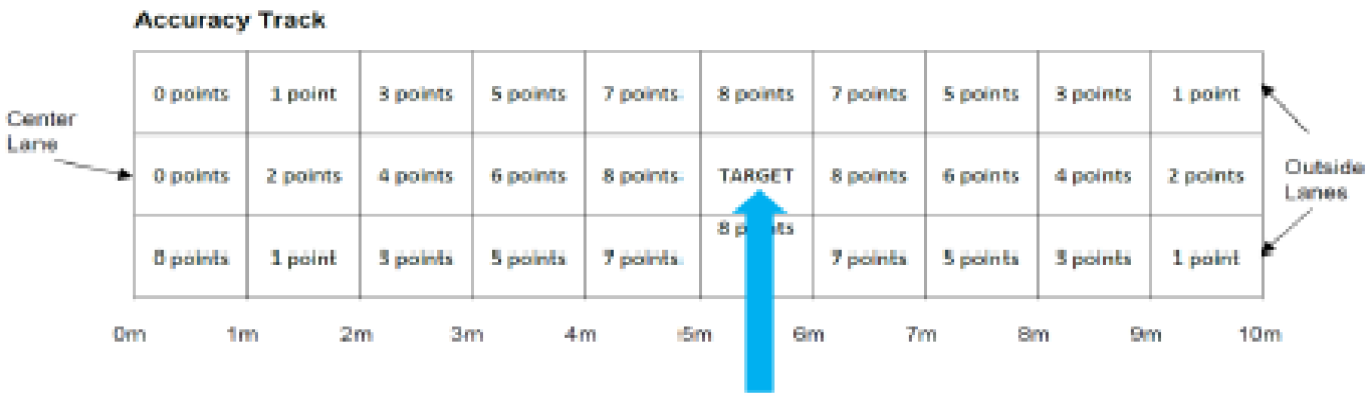
- The track specs are 10m long X 3m wide.
- Teams must release their Jet Toy behind the 0m mark.
- The Jet Toy must stay on the track for the trial to be valid (if Jet Toy leaves the track, points are awarded at point of exit).
- Jet Toy balloon must be inflated to an 8-inch diameter or less. The track judge will check balloon diameter before Jet Toy is released.

Tier1	Tier2	Tier 3
Basic calculation	Make your model and test it	Multitasking prototype which perform different tasks.

Team Size: 2 per team.

Judging criteria & Marking scheme

- Each team gets three trials.
- Final score is based on the sum of the three trials. The track judge will determine the point total for each trial.
- The point total is determined by two components:
  - The point value of the box where the Jet Toy stops (50% or more of the Jet Toy must be in the box to receive that box's point value)
  - The distance (in cm) from line of the box furthest away from the center target to the wheel closest to the center target. The lane that it is in does not matter. Please see examples below.
  - If the Jet Toy lands on the center target, the point value is determined by using the measurement that is closest to the center of the target.



49. Solar Circuit Designing

Concept

Energy from the Sun is harnessed using a range of ever-evolving technologies such as solar heaters, photovoltaic cells, solar furnaces etc. Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaic (PV) cells, or indirectly using concentrated solar power, or a combination.

Objective

The Solar Photovoltaic (PV) sector is the largest and fastest growing renewable energy sector. There is an increasing need for experts that can support this growth. The event aims at enhancing the knowledge of the contestants in solar circuits. The main objective of the event is to design and execute a circuit satisfying the given condition.

Team Size: 3 per team

Competition Rules

Tier1	Tier2	Tier 3
MCQ's based on solar energy and solar cells	Design virtually circuit based on given conditions	Prototype a working model

Kits and Aids

- All required components will be provided.
- Any specific components if required shall be indicated or mutually agreed with SAEISS authorities at the time of registration.

Judging Criteria

S.No	Criterion	Marks
1	Circuit layout and design	30
2	Output obtained from circuit	40
3	Knowledge about the components	30
Total marks		**100**

50. Python Programming

Purpose of the event

- Drafting the basic flow chart and logic for the given program and solving the problem by executing the code using python.

Alignment with curriculum

- Logical thinking
- Application of problem solving methodologies
- Coding knowledge

Expected Skills

- Must have knowledge in algorithms, drafting flowcharts, debugging and programming using python.

Tier1	Tier2	Tier 3
Debug the given program and use it to solve the problem.	Algorithm, flowchart and program for solving the given problem.	Use python for solving engineering problems.

Kits and Aids

- Python 3.6 module (32-BIT)
- Idle (Python 32- BIT)

Competition rules

- Contestants are expected to bring laptops with stipulated version of the software.
- Complete the flowchart and algorithm within the given time.
- Execute the given program without any error before the stipulated time.

Team Size : 3 students.

Judging Criteria

- Correctness of the logic
- Efficiency and versatility of the program
- Originality of the code
- Performance in Viva round

51. IT Software Solutions for Business/Engineering

Background

Developing software solutions to improve business productivity encompasses many different skills, however, key to all these is an individual's passion and ability to keep up with the rapid pace of change.

Working closely with clients, as individuals or in a team, the software professional might be responsible for one or more roles including business/system needs analysis, developing system specifications, system design, programming, installation and testing, end-user training, system improvement and maintenance.

Concept

Participants will be inputting, manipulating, outputting and presenting information and will need to demonstrate Accuracy

· Knowledge

· Time management skills

Event BluePrint

Tier1	Tier2	Tier 3
Participants are requested to perform the activity with MS word. Activity related to 1.Formatting and organizing the given content with Microsoft Word tool 2. Create a new document for the sample provided	Participants are requested to do perform the activity with MS Excel and Prepare a presentation with data.	Developing software solutions with MS access for database storing and create a macro in excel for the given problem.

Materials Required

All the team members shall bring their own laptop with Microsoft office installed prior to the event.

Competition Rules

- A maximum of 3students are allowed per team.
- Based on the presentation and solutions provided by team to be evaluated and time is important.
- Judging will be done based on the accuracy, correct answer and best solutions provided within the given time frame.
- Judges Decision will be the final.

52. Web Design and Development

Background

Design and Developing software solutions for a business problem. The competition covers a broad range of technical skills as well as disciplines and their application in the production and maintenance of overall Web Design and Development.

Concept

Participants are involved in implementing specific solutions that follow business rules and objectives and converting these into website specifications.

- Knowledge in W3C standards for HTML and CSS
- Search Engine Optimization (SEO) and performance optimization
- Time management skills

Event BluePrint

Tier 1	Tier 2	Tier 3
Participants are requested to perform the activity with the agreed tool set Activity related to 1.Work organization and management 2.Website design 3.Website layout	Participants are requested to perform the activity of having Backend data connection to MYSQL, deployment of application.	Demo the Complete Software developed .

Materials Required

- All the team members shall bring their own laptop with appropriate software installed prior to the event.
- The following tools and materials will be used in the competition:
- The World Wide Web Consortium for HTML and CSS
- JavaScript.
  - Object-oriented PHP

- Open Source server side Libraries and Frameworks
- My SQL
- FTP server and client relationships and software packages
- Software design pattern
- Web application security
- Content Management Systems (CMS)

Competition Rules

- A maximum of three students are allowed per team.
- Teams have to complete all the rounds.
- Based on the presentation and solutions provided by team to be evaluated and time is important.
- Judging will be done based on the accuracy, correct answer and best solutions provided within the given time frame.
- Judges decision will be the final.

53. Cloud Computing

Background

The present era is said to be an era of information and the period of digitization. The digital information is generated in terabytes daily through various sources like smart phones, social networks, sensors, user generated content. This digitization has raised several issues with respect to data storage on cloud. In the future era of Internet, this explosion of raw data and dependence on data services will grow by four fold due to storage proliferation of data intensive services and the digital convergence of telecommunication, media and Information Communication Technology (ICT).

The next generation data models for storage delivery would migrate to cloud based infrastructure for storage which will be based on data objects with rich, extensible metadata and elaborated access methods. Such infrastructures will face several research challenges which need to be addressed in order to overcome limitations related to issues like storage access, mobility, cost, energy, security, interoperability, efficiency, etc.

Concept

Participants will be required to

1. Evaluate, select and implement foundational cloud computing services such as compute, network, and storage for a given business problem.
2. Evaluate, select and any one of network-related technologies to infrastructure design such as network communication protocols, subnetting, NAT, DNS, VPN, broadcast networking, and dynamic routing protocols.
3. Design and develop authentication processes at a departmental and organizational level, controlling access to public cloud administrative capabilities and system access.

4. Develop policies and procedures for systems and application access to public cloud interfaces and services.

Event BluePrint

Tier 1
Systems Design/Deployment – When designing and deploying a web application, the fundamental building blocks of being able to scale is understanding how to implement an architecture that can scale. Participants will need to showcase their understanding in decoupling the database from the application, utilizing additional options and effective implementation of integration. **Network Design** – When scaling a web application and breaking up the workload into different tiers and services, the network design must ensure that only servers and services that should be public remain public. To ensure network security, the application should communicate with services on private networks where possible. **High Availability** – In today's web applications high availability is an essential aspect. Participants will need to keep this in mind and implement ways to ensure the web application can deal with issues and still remain a running application.
Tier 2
Scalability – In order to keep costs low when there is low usage and scale to meet high traffic to provide a consistent user experience, the application must scale or the application must be scalable. Scalability in every aspect of the web application allows the application to grow only where needed. Correctly implemented this goes hand in hand with monitoring and automation. **Automation** – Automation is one of the fundamental building blocks of being able to scale a web application. Automation of application deployment process, infrastructure provisioning automation and self-configuration. **Security** – When scaling a Web Application, security at every layer of the application is essential. Where network traffic is allowed to come from, who can access the servers, what permissions are applied to the servers and users, who has access to the databases and data.
Tier 3
Provide a detailed Study after Tier1 and Tier2 1. How Cloud computing can drastically reduce the Software Development time 2. Provide a Mathematical model for calculating the cost of transfer of in house to cloud environment

Materials Required

All the team members shall bring their own laptop with the appropriate software installed prior to the event.

Competition Rules

- A maximum of two/three students are allowed per team.
- Teams have to complete all the rounds..
- Based on the presentation and solutions provided by team to be evaluated and time is important.
- Judging will be done based on the accuracy, correct answer and best solutions provided within the given time frame.
- Judges decision will be the final.

54. Entrepreneurship (Business Sprint Challenge)

Background

Over 85 percent of new businesses fail within a few years, often because they try to plan their way to success. What's worse, research suggests that writing a business plan has no correlation with success. It's time to change. Business Model Competition represents a radical departure from the past and the crest of a new paradigm in entrepreneurship.

Concept

The Business Spring Challenge is not a business plan competition. Participants won't be rewarded for doing lots of library research, drawing fancy graphs, or crafting the perfect sales pitch to venture capitalists.
Teams are evaluated based on
1) Breaking down their idea into the key business model hypotheses

2) Getting outside the building and testing their assumptions with customers
3) Applying Customer Development / Lean Startup principles to make sure they nail the solution, and
4) Learning to pivot (or change) until they have a customer-validated business model

Event BluePrint

Tier 1
Participants team shall bring an 8 minute video of their Business model and present to the Judge. Hypothesis: Did the team use a canvas to identify and track hypotheses? Did the team clearly state their hypotheses? Did the team identify the most crucial hypotheses to test first (the ones that could kill their business)?
Tier 2
Test Did the team design low cost, rapid, but reliable tests of these hypotheses? Did the team conduct the tests in a reliable manner? Number of tests - should be adjusted for industry, product type (web vs physical product), and business type (B2B vs B2C) Quality of tests - interviews are high quality, surveys & focus groups are much lower quality (you don't know which questions to ask) unless interviews have been con-ducted first If appropriate, has the team developed a prototype or minimum viable product (MVP)? Does the team understand the hypotheses they are testing with a prototype or MVP? Is the proto•type or MVP appropriate to answer those hypotheses?
Tier 3
Did the team clearly state their insights and learning, how those validated or invalidated a hypothesis, and if that informed any pivots (changes)? If changes were made, was the pivot the team made supported by evidence or did they fail to pivot when the evidence clearly stated it? Does the team have significant evidence that the solution is validated (i.e., letters of intent, purchase contracts, sales, partners, etc.)? Is the team solving a significant problem (defined in terms of money or impact)?

Note: Because web-based businesses are easier to test, these companies can often pivot faster. Judges are asked to not penalize physical product companies or health-related businesses because they have not pivoted as much or made as many iterations as web-based businesses.

Materials Required

All the team members shall bring their own laptop with Microsoft office installed prior to the event.

Competition Rules

- A maximum of 3 students are allowed per team.
- Teams have to complete all the rounds.
- The teams should be able to within the given time as specified in the questions. No extra time will be provided.
- Based on the presentation and solutions provided by team to be evaluated and time is important.
- Judging will be done based on the accuracy, correct answer and best solutions provided within the given time frame.
- Judges Decision will be the final.

55. Plant layout in manufacturing engineering

About:

All industries are feeling the pressure of digital transformation. Products and factories that make them continue to become smarter and more complex. Rapidly advancing digital technology is driving innovation everywhere

Manufacturers must rethink every aspect of their business and embrace digitalization. Manufacturers can predict the future by showing much greater flexibility in reacting to continuously changing customer demand and future orders

Purpose of the event:

The Judges will provide the challenge for the participants. Participants are expected to solve the challenge and show the result as expected by the judge

Tier 1	Tier 2	Tier 3
Idea about Automation. Identification and make simple diagram for given product manufacturing process.	Detailed study of given product , Develop product manufacturing plan or plant layout.	Simulate industrial product process plan layout of given problem using Siemens software. Optimize the design.

Competition rules:

- Maximum 3 participants per team
- The participants should complete the given challenge in the stipulated time
- No extra time will be given
- Participants are expected to bring laptops for presentation

Judging criteria:

- Judging should be done based on the presentation and solution presented by the team
- Feasibility, correctness and accuracy of the solution along with time taken should be taken into consideration

56. Refrigeration and air conditioning

Purpose of the event:

- Identify and describe the R&AC system and its components along with uses
- Draw schematic diagram of the given system

Expectations:

Tier 1	Tier 2	Tier 3
Participants are questioned and analyzed based on their knowledge regarding basics of Refrigeration and Air-conditioning. Domestic air conditioning with multiple components (evaporator , condensers, compressors, and simple cascaded systems)	Solve industrial air conditioning problem (problem provided at the time of event).	Make proper air conditioning in a real room with different heat sources. (required condition is specified). Simulate the air conditioning system in software.

Kits And Aids

Refrigerator and Air conditioner will be provided for teams clearing the prelims. A4 sheets also will be provided. Drawing accessories must be brought by students.

Competition rules:

- Team size : Maximum of three members per team
- The team should be able to find out the system and its components within the given time
- No extra time will be provided

Background

- R&AC competition reflects a range of different systems and its components used in Heating ventilation, Refrigeration and air conditioning industries.

Judging criteria:

- Teams should be judged based on identification and description of components
- Time taken by teams should also be taken into consideration

57. Embedded system Design

Origin of all Automation started from the core – Mainly starting from Low Level Embedded Controllers. Embedded Systems has brought about a revolution in Science. Uses of embedded systems are virtually limitless because every day new products are introduced to the market which utilize embedded computers in a number of ways.

Latest trend is that embedded systems are also part of the Internet of Things (IoT) – a technology in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. But Main concern is the security and privacy of the data which is shared to the cloud space or external devices.

What We Are Up To?

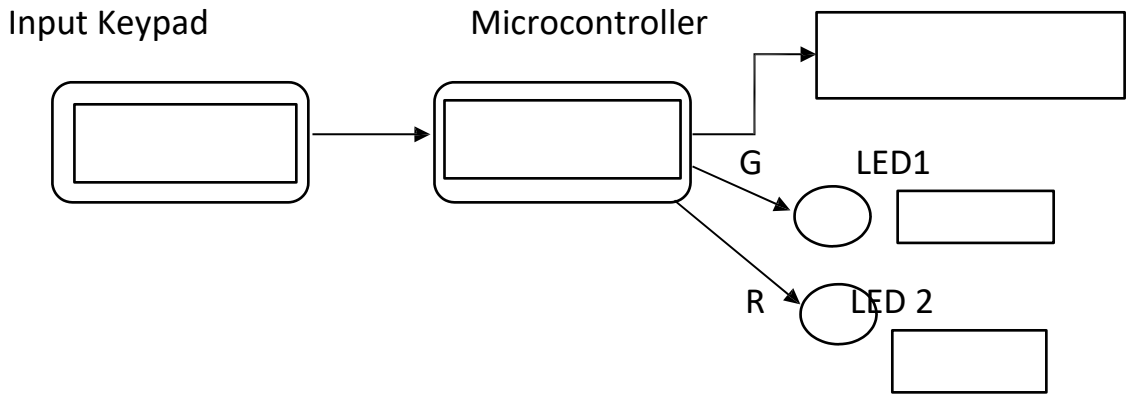
Focus on making Embedded System Design more resilient to threats, by designing and implementing reliable product. The challenge will have two phases: a **preliminary** qualification phase, where teams allowed to take a written test, describing their project and a **final phase**.

WHAT All We Have In This Challenge?

Tier 1	Tier 2	Tier 3
Written test (Hint: Working on Embedded Systems) . Write a program in embedded C language for a microcontroller.	Interface the required hardware modules like LCD, Motor, Keypad, Touch Screen etc. to demonstrate the required functionality. New Challenge will be assigned at the venue by Judge. Presentation of the work done.	Demonstrate your model . Make different task done by using model by changing the program(Tasks problems are given at the time of event)

- **Expectations for Tier 2 ,3:** Write a program in embedded C language for microcontroller, as used in digital electronic key safe device to achieve the following functions (Ref the below diagram)

- Power on LCD Display
- Set and Clear Password via Keypad
- Glow Green LED on Successful authentication
- Glow Red LED on Failure with retry option.



Materials Required

- Participants are free to bring their own tools softwares installed in their laptop.

Competition Rules

- A maximum of three students are allowed per team
- New Challenges will be given during the Problem Statement walkthrough session.
- Students are expected to design logics and build software pipelines which satisfies all the requirements of the Problem Statements.
- Teams which are able to complete the maximum number of rounds satisfying all the judging criteria will be declared as the winners.
- Students are motivated to use any technology to achieve the objectives of the Problem Statement.
- Any other doubt/rules shall be clarified with the judge before the start of the competition
- Judges decision will be the final.

Judges Criteria

- JC1::Technology used with Design Review
- JC2::Software code and Hardware demo review
- JC3::Testing Techniques for solving the problem statement

58. Autonomous Vehicle Challenge

Self-driving vehicles are cars or trucks in which human drivers are never required to take control to safely operate the vehicle. Also known as autonomous or "driverless" cars, they combine sensors and software to control, navigate, and drive the vehicle.
Not only are almost all major car makers investing in Self-driving vehicles technology, but
Forbes predicts there are more than 1700 startups determined to disrupt the car industry.
The global market for autonomous vehicles will be worth $54.23 billion in 2019 and increase to $556.67 billion by 2026 with a compound annual growth rate of 39.47% during that period

Concept/Problem Statement

To construct software pipelines for images and videos used in real-time Self driving Cars.

Event BluePrint

Tier 1	Tier 2	Tier 3
MAT1:: Accept an Image (*.JPEG, *.PNG) if the input is an Image	MAT2:: Accept an Video (*.MP4) if the input is an video.	MAT3:: Process and produce either an Image Output or Video Output with some or full level of details required as per the Problem Statement. Presentation of the work done

Materials Required

- Minimal tools to be used shall be provided. Participants are free to bring their own tools
  Software's installed in their laptop.
- Participants are expected to bring own hardware for demo.
- Participants are given any choice to select the Software and Hardware.
- Below are few references provided for this event.

- Anaconda 3/2 – Spyder, Jupyter Notebook
- Python – numpy, cv2, matplotlib.pyplot, matplotlib.image
- Image Processing techniques
- Matrices and Vectors
- Linear Equations

Competition Rules

- A maximum of three students are allowed per team
- Images/Videos would be provided during the Problem Statement walkthrough session.
- There would be multiple rounds based on the Problem Statements.
- Students are expected to design logics and build software pipelines which satisfies all the requirements of the Problem Statements.
- The Final solution should satisfy all MAT tests.
- Teams which are able to complete the maximum number of rounds satisfying all the judging criteria will be declared as the winners.
- Students are motivated to use any technology to achieve the objectives of the Problem Statement.
- Any other doubt/rules shall be clarified with the judge before the start of the competition.
- Judges decision will be final.

Judges Criteria

- JC1::High Level Presentation of Project (Maximum of 2 Slides)
- JC2::Technology used with Design Review
- JC3::Requirement Coverage
- JC4::Testing Techniques for solving the problem statement

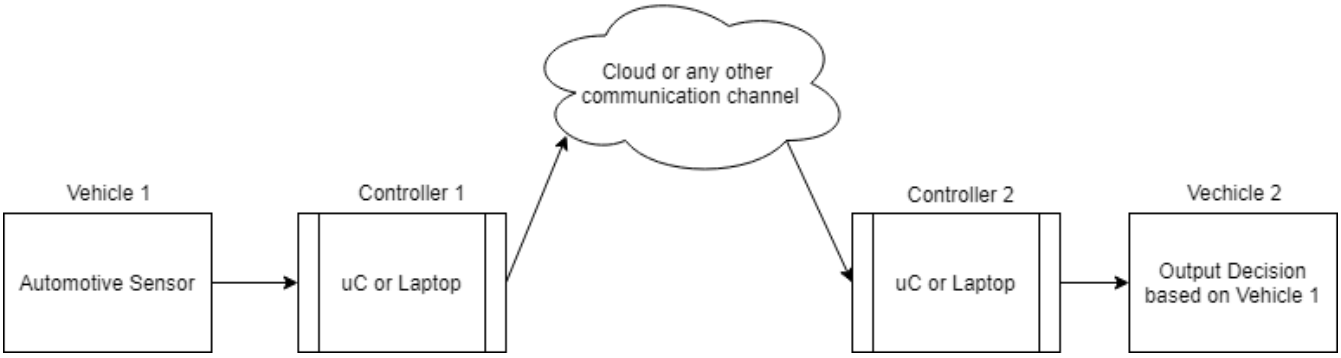
59. Connected Vehicle Competition

Background

Vehicle to vehicle (V2V) communication market includes a transmitter and receiver that
help the cars to broadcast the brake status, speed, position, steering-wheel position and other data to other vehicles within a range of few hundred meters.
Connected vehicles could make use of the information in order to build in depth depiction of what's unfolding around them, enlightening any sort of danger and alerts the driver, or the best sensor system, would miss or fail to anticipate.
V2V communication market size was estimated at over USD 15 billion in 2015 and is likely to witness gains at an estimated CAGR of more than 5% up to 2023

Concept/Problem Statement

To enable decision making in remote vehicles based on real-time sensor readings



- Vehicle 1 is an automotive sensor (declared at event) which needs to be interfaced with a microcontroller/Laptop to extract the real time sensor values.
- Controller 1 which is a Microcontroller (uC) or Laptop needs to process the incoming data from the Vehicle 1 and transfer it to Controller 2 via a **wireless stream**.
- Controller 2 should be able to acquire the data sent by Controller 1.
- Vehicle 2 is a software interface in Controller 2 which displays a decision based on Vehicle 1 Data

Event BluePrint

Tier 1	Tier2	Tier 3
MAT1: Controller 1 should be able to interface Vehicle 1 Sensor data MAT2: Controller 1 should be able to communicate to Controller 2 via a wireless method.	MAT3: Data should not be lost during the communication interface between Controller 1 and Controller 2	MAT4: Controller 2 should be able to produce results with partial or full level of details required as per the Problem Statement

Materials Required

- Minimal Tools to be used shall be provided. Participants are free to bring their own tools software's installed in their laptop.
- Participants are expected to bring own hardware for demo.
- Participants are given any choice to select the Microcontroller, software and Hardware.
- Below are few references provided for this event.

- Sensors and their Interfacing – SPI, I2C, UART etc.
- Microcontrollers – Arduino, Cypress, TI, National Instruments etc.
- Single Board Computers – Raspberry Pi, Beaglebone, Odroid etc.
- Software – C, C++, Python, LabVIEW, MATLAB etc.
- Hardware – Breadboards, Jumper Wires as required, Power supplies, micro controllers if required.

Competition Rules

- A maximum of three students are allowed per team
- Information about the Sensor and Decision-making algorithm will be disclosed during the Problem Statement Walkthrough session.
- Students are motivated to use any technology to achieve the objectives of the Problem Statement.
- No physical communication methods are allowed between Controller 1 and Controller 2.
- Projects will be evaluated based on the Technology used, transmission Range, Ergonomics, Design and Cost of Prototype.

- The Final solution should satisfy all MAT tests
- Any other doubt/rules shall be clarified with the judge before the start of the competition
- Judge's decision will be the final.

Judges Criteria

- JC1: High Level Presentation of Project (Maximum of 2 Slides)
- JC2: Technology used
- JC3: Range of the Communication Module
- JC4: Ergonomics, Design and Prototype for the event

60. Bi-cycle Assembly & Maintenance

Background

Participants seeking knowledge in Bi-Cycle Engineering. Young Enthusiasts who would like to do all of their own maintenance work for Cycle. Anyone who is interested in taking Bicycle Repair & Overhaul as part of daily work. Bicycle assemblers who need to improve their assembly skills.

Concept

Participants to develop the skills in assembly and disassembly of the bicycle, by using appropriate skills and technique.

Event BluePrint

Tier 1	Tier2	Tier 3
Preliminary test based on product assembly.	The fastest to disassemble and assemble the bicycle would be judged on the no of participants. Time for the competition shall be 20-30 minutes, subject to change depending on the availability of resource and time	Fastest to disassemble the cycle and assemble from a collection of parts randomly placed (mix the original cycle parts with other machine parts or other standard parts

Materials Required

- A standard bicycle shall be provided to carry out the exercise.
- Minimal tools to be used shall be provided. Participants are free to bring their own tools, subject to approved by the competition Judges.
- Any consumables that may be required like lubricants/waste clothing, shall be made available however participants can bring their own

Competition Rules

- A maximum of 3members are allowed per team.
- Completion of the assembly means the bicycle should be worth of riding for predetermined distance (around 100m). Only completely

assembled cycle shall be considered for allocation of marks.

- Assemble a standard assembly like wheel/with spokes shall be considered as an integral assembly.
- Any other doubt/rules shall be clarified with the judge before the start of the competition
- Judging will be done based criteria specified provided within the given time frame.
- Judges decision will be the final.