

# SELECT Make-A-Thon 2019

## Problem Statements

Sr. No	Problem Code	Problem Statement
<b>HEALTH CARE</b>		
1.	<b>HL – AL – 01</b>	<p><b>Technology should help us in converting guess work into truths.</b>            The areas where we apply our guess work can be:</p> <ul style="list-style-type: none"> <li>• Diagnosis</li> <li>• Treatment</li> <li>• Interpretation of lab results</li> </ul> <p>In diagnosis we</p> <ul style="list-style-type: none"> <li>• Sense</li> <li>• Touch</li> <li>• Hear</li> </ul> <p>The problems which our mind cannot visualise but is visible to our eyes.  <b>Colour:</b> There are several conditions where localised colour change happens, increased or decreased pigmentation.  <b>Grading of Redness:</b> Lot of skin problems produce redness. A machine is required to grade the redness.  <b>Itching:</b> Itching is very resistant to treatment. Application of water reduces stinging sensation. A Machine is required to do this effectively.  <b>Dryness:</b> It is compensated with oil based liquids. Can Machines counter it?  <b>Skin Temperature Changes:</b> It gives clues to diagnosis. The need is to pick up changes in temperature.</p> <p><b>Propose a prototype which can handle all the above explained issues efficiently and effectively.</b></p>
2.	<b>HL – AL – 02</b>	<p><b>Counting respiratory rate per minute.</b>            The speed at which chest moves per minute is called respiratory rate. The challenge is to diagnose the number one killer disease Pneumonia by measuring respiratory rate.</p>
3.	<b>HL – AL – 03</b>	<p><b>Nebuliser and Oxygen Combination</b>            Nebuliser has a motor, which draws air and pushes it through a chamber containing medicine, which vaporises and gets deposited into the lung. Now there are oxygen concentrators, which take oxygen from atmosphere and give 80% oxygen.</p> <p><b>The challenge is to design a machine to concentrate oxygen.</b></p>
4.	<b>HL – AL – 04</b>	Design a mobile phone operated nebuliser.
5.	<b>HL – AL – 05</b>	The top of every house fan catches dust which causes wheeze. Design a machine to clean the top of fan.
6.	<b>HL – AL – 06</b>	The challenge is to catch the sleep which is assessed by rapid eye movements.

7.	<b>HL – AL – 07</b>	Design a machine to control snoring.
8.	<b>HL – AL – 08</b>	As of now peak flow meters is a simple tool to assess lung function. The challenge is to use the mobile phone to assess the same.
9.	<b>HL – AL – 09</b>	To confirm urinary tract infection in children (18 months), a needle is injected into the abdomen below umbilicus, and urine aspirated. Many times there is no fluid. This is called dry tap. Ultrasound can help if there is urine in the bladder, before giving the painful injection. Design an instrument to replace ultrasound here!
10.	<b>HL – AL – 10</b>	The instrument used to see inside the anus is called proctoscope. These are not available for new born, but they are the ones who need it most. Design 2 mm diameter and 25 mm length probe connected to a monitor.
11.	<b>HL – AL – 11</b>	Alcohol is assessed by breath alcohol test. Design a device such that can blood sugar be assessed in the same way.
12.	<b>HL – AL – 12</b>	Adenoid is a tissue situated at the back of the nose. How to reach the drug there? (see nose picture for the same)
13.	<b>HL – AL – 13</b>	Cervical spondylitis affects all. Neck collars and neck traction are two treatments. Design a substitution for these.
14.	<b>HL – AL – 14</b>	Design a tooth brush without handle for children, so that by putting the instrument in their index finger, they must be able to brush.
15.	<b>HL – AL – 15</b>	An instrument to clean deep umbilicus in obese person
16.	<b>HL – AL – 16</b>	In diabetes, the silver foil is opened and it is automatically entered in to the system, there by proving that the person has taken the medicine. This is also true for tuberculosis.
17.	<b>HL – AL – 17</b>	TB patient spits into a container, which immediately sterilises the sputum and makes it non infective.
18.	<b>HL – AL – 18</b>	An instrument to clean the web space, the gap between fingers and toes in diabetics.
19.	<b>HL – AN – 19</b>	<b>Intelligent Systems for Smart Health Care</b> Develop novel motor Imagery based brain switch for patients with amyotrophic lateral sclerosis.
20.	<b>HL – AN – 20</b>	<b>Intelligent Systems for Smart Health Care</b> Develop a wearable system that detects posture and heart rate. (Designing an Integrated device with multi parameter measurements for better health care.
21.	<b>HL – CL – 01</b>	<p>ATOM ECG device is a 12 lead ECG device. After the 12 lead ECG is recorded, it is sent to a cardiologist for interpretation. The arrhythmias as detected by the doctor is difficult for the patient to understand. So the requirement is to:</p> <p><b>Design an interactive Augmented Reality system to help understand the type of arrhythmia by the patient. (Assuming the patient has a basic education up to class 12th and knows English).</b></p>

22.	<b>HL – CL – 02</b>	<p><b>Develop a Machine Learning algorithm to classify the cardiac anomalies from the 12 lead ECG.</b></p> <p>For that, a desktop software to allow a doctor to mark the various points (Pon, Poff, Q, R, S, T, J etc) in the 12 lead ECG signal provided in JSON format. This marking by the doctors will be used to train the network.</p>
23.	<b>HL – CL – 03</b>	Mobile Phone based Skin Cancer/Skin Disease detection and classification system.
24.	<b>HL – CL – 04</b>	Innovative low cost approach for adherence to the immunisation program of new born in rural areas.
25.	<b>HL – CL – 05</b>	Low cost approach to Identifying counterfeit drugs.
26.	<b>HL – CL – 06</b>	Monitoring of low cost system to monitor tooth decay in dental roots using IR camera system instead of x-ray.
27.	<b>HL – CL – 07</b>	Design a low cost system to measure Vital lungs capacity on smart phones.
28.	<b>HL – CL – 08</b>	Design a low cost system to monitor exhaled Carbon Monoxide level on a smart phone for smokers.
29.	<b>HL – CL – 09</b>	Design an innovative BP measurement system from ECG and PPG (Pulse Plethysmography)
30.	<b>HL – CL - 10</b>	Game development for patients who need chiropractors.
31.	<b>HL – CL - 11</b>	App to continuously monitor fall detection of old age people. (HRV changes can be a useful trigger)
32.	<b>HL – CL – 12</b>	Innovative approach to reduce pain during menstrual cramps.
33.	<b>HL – CL – 13</b>	Health App to monitor calorie input (food) and exercise done to burn calories.
34.	<b>HL – CL – 14</b>	Mobile camera based app to measure Diabetic retinopathy plus algorithm to classify the severity of the same.
35.	<b>HL – CL – 15</b>	Smart Phone based system to continuously monitor the temperature of the baby (for fever as well as temperature drop below threshold).
36.	<b>HL – CL – 16</b>	Smart Phone based system to continuously monitor whether the baby is continuously breathing and instantly raise an alert/alm when the baby stops breathing.
37.	<b>HL – CL – 17</b>	Smart Phone based system to clearly see foreign body inserted in nose/ears in children.
38.	<b>HL – CL – 18</b>	Smart Phone based solutions to monitor normal/abnormal growth of foetus.
39.	<b>HL – CL – 19</b>	Smart Phone + accessory based system for mothers to hear the heart rate of their foetus.
40.	<b>HL – BV – 01</b>	<b>Blood flow measuring Unit for Heart Lung Machine.</b>

		<p>A heart lung machine is a medical device that provides mechanical circulatory support in the form of blood flow and respiration to the patient in the operating room while the heart is clinically arrested.</p> <p>Currently, the blow flow is measured using techniques like On-Line electrical impedance measurement for monitoring blood viscosity during On-Pump Heart Surgery.</p> <p>Propose an innovative idea to efficiently measure the blood flow for a heart lung machine during a surgery in an operating room.</p>
41.	<b>HL – BV – 02</b>	<p><b>Temperature Regulator for Hypothermia in Operation Theatre and ICU</b></p> <p>In an operation theatre while administering general anaesthesia, vital parameters like body temperature need to be continuously monitored. Hypothermia is a condition in which the body dissipates more heat than it absorbs. If not monitored and regulated properly it can lead to inadvertent temperature complications.</p> <p>As of now various warming and cooling devices are available to monitor the perioperative normothermia.</p> <p>Develop an idea to build a thermo regulator for Hypothermia in Operation Theatre and ICU.</p>
42.	<b>HL – BV – 03</b>	<p><b>Body Impedance based BMI and Fat analyser</b></p> <p>The commonly used indicators for obesity are body mass index, waist circumference, waist-height ratio, and waist-to-hip ratio. Bioelectrical impedance analysis produces a close estimate of fat mass in a wide range of body compositions.</p> <p>Currently, the widely used and accepted method to measure and analyse body mass index (BMI) and fat is Body bioelectric impedance because other obesity indicators do not measure body fat because of their inability to distinguish fat from muscle.</p> <p>Propose an innovative idea to build a device to measure and analyse the body mass index and body fat using bio electric impedance.</p>
43.	<b>HL – BV – 04</b>	<p><b>Blood backflow detector for Intravenous Infusion</b></p> <p>In conditions when a patient cannot be orally fed intravenous infusions are used to keep the patient hydrated to maintain the level of essential body liquids. Thus, monitoring of intravenous fusions is of utmost importance. Manual monitoring of is a trivial task for medical personnel when the number of patients is large.</p> <p>Propose an innovative and efficient automated detector to monitor backflow of fluids in intravenous fusion.</p>
44.	<b>HL – BV – 05</b>	<p><b>Drug Delivery device with accurate volumetric monitoring</b></p> <p>During a medical condition, delivering drugs in the right amount is of utmost importance. Failure to do so results in medical complications and casualties. Currently, infusion pumps deliver measured amounts of fluids or medications into the bloodstream over a period of time.</p> <p>Propose an idea that takes this concept ahead with extreme volumetric precision in terms of delivering drugs into the bloodstream.</p>

45.	<b>HL – BV – 06</b>	<p><b>Precise Body Temperature Monitor with Alarm limit settings-</b></p> <p>Body temperature provides cues to onset of infection, inflammation, and antigenic responses, as well as indicating efficacy of treatment. Healthcare organisations are using Body Temperature Monitor which continuously measures the body temperature and relays the data with the help of various sensors. These devices receive alerts when temperature starts to rise and hence helps the patient to monitor his health. Propose an idea through which a system can realize body temperature signal, processes measurement signal and displays the temperature with alarming equipment such that the system keeps check on the maximum limit of the body temperature with very less measurement error.</p>
46.	<b>HL – BV – 07</b>	<p><b>ECG Monitor from Upper Limbs (2 electrodes)</b></p> <p>In our human body, electrical signals move through the heart. There are devices like ECG monitor records the strength and the timing of these signals using graphical display. Traditional monitors use patches and wires to attach electrodes to the body and communicate the ECG trace to a receiver. The penetration of ECG monitors into different departments has resulted in growing demand for ECG data management solutions for collecting data and streamlining report generation. Propose an idea to measure electrical signals from upper limbs via ECG monitor with two electrodes that is easy to use and is gentle to your skin so that it can be comfortable to wear.</p>
47.	<b>HL – BV – 08</b>	<p><b>Non Invasive Hemoglobinometer</b></p> <p>A Hemoglobinometer is an instrument used to determine the haemoglobin content of the blood. These Hemoglobinometer provide easy and convenient measurement, which is particularly useful in areas where no clinical laboratories are available. It is also useful in emergencies due to its ease-of-use, accuracy, and fast delivery of results. Propose an idea through which we can determine the haemoglobin without involving any device into the body. The technology used should be non-invasive, easy and display accurate measurements of blood parameters under extreme conditions and diverse climatic conditions.</p>
48.	<b>HL – BV – 09</b>	<p><b>RR Detector</b></p> <p>R wave is usually the tallest and most conspicuous component of ECG, for assessment of the beat to beat interval, detection of R to R interval is the standard practice. The conventional, industry derived fully automated R-R detection system are closed and compact and provides automatic output in the form of interpreted results, gives hardly any scope of innovation and independence in research. There is risk of error in case of low amplitude R waves, high amplitude T wave, arrhythmia, block, ectopic beats and also loss of valuable physiological information. Propose an idea to determine RR detector to reduce such risks. The idea must involve a system that determine RR interval and should be compatible.</p>
49.	<b>HL – BV – 10</b>	<p><b>Non Invasive Sleep Apnea therapy Device with leak compensation of 15-20%</b></p> <p>Sleep apnea is a health problem when either breathing is interrupted by blockage of air flow or is stopped due to lack of effort to breathe. People may not be aware with this problem in most of the cases. Few remedies to this</p>

		disorder are to lose weight, surgery etc. Some treatments involving technology are a mouth device known as a mandibular advancement appliance works by moving the jaw forward, which increases the size of the upper airway and reduces air resistance that leads to sleep apnea and snoring. Propose an idea which helps in the treatment of this disease which should involve a non-invasive device that must have leak compensation of 15-20%.
50.	<b>HL – CM – 11</b>	Pupil size and reaction to light are measured to assess neurological function. Currently pupil size is estimated visually. Design a phone app for Pupil Size measurement.
51.	<b>HL – CM – 12</b>	Continuous EEG monitoring is useful in identifying seizures in critical patients. Develop a compact and wireless EEG continuous monitoring device.
52.	<b>HL – CM – 13</b>	It is difficult to measure the weight and height of patients unable to stand. Develop an ICU Nurse assist software which can estimate, height, length and weight of patient including 45 degree head up measurement.
53.	<b>HL – CM – 14</b>	It is difficult to measure the weight of patients unable to stand. Develop an ICU cot which measures the weight of the patient.
54.	<b>HL – CM – 15</b>	It is not possible for senior ICU doctors to be at the bedside all the time. Design an ICU telemetry robot which can allow high quality video call and can share information from pumps & monitors.
55.	<b>HL – CM – 16</b>	Haemoglobin is measured as a blood sample. It would be nice if it can be done non-invasively. Estimate Haemoglobin level from - nail bed and lower lid conjunctiva
56.	<b>HL – CM – 17</b>	Connecting and disconnecting syringes and IV lines to central lines can lead to infections. Develop a Central line injection handling robot which can perform loading and administering.
57.	<b>HL – CM – 18</b>	Handling ICU patients to position them can lead to infections. Develop a Patient care assist robot for the same.
58.	<b>HL – CM – 19</b>	Low blood pressure in ICU patients is treated with continuous infusions of drugs which need to be frequently adjusted according to BP. Develop a Closed loop continuous infusion pumps for BP control.
59.	<b>HL – CM – 10</b>	Inserting central lines into veins is a dangerous procedure and needs expertise. Develop an Automated venous access under ultrasound guidance.
60.	<b>HL – CM – 11</b>	Controls on the ventilator are adjusted according to CO <sub>2</sub> , O <sub>2</sub> levels. Develop a closed loop ventilation control – with ETCO <sub>2</sub> and SPO <sub>2</sub>
61.	<b>HL – CM – 12</b>	An ophthalmoscope is used to look at the retina to identify diseases. Develop a phone app for the same.
62.	<b>HL – CM – 13</b>	Audiometry is a test to detect hearing. Develop a phone app for the same.
63.	<b>HL – CM – 14</b>	Vibration testing is used to test for nerve functions. Develop a phone app for the same.
64.	<b>HL – CM – 15</b>	Design and develop temporal order stimulus / psychophysics testing platforms

65.	<b>HL – CM – 16</b>	Develop a solution for dexterity assessment for spasticity.
66.	<b>HL – CM – 17</b>	Medical students need to learn abnormal heart and lung sounds. Design and develop an auscultation trainer with pulse.
67.	<b>HL – CM – 18</b>	Advanced cardiac life support is important in treating patients with cardiac arrest. Students need to learn decision making. Design a VR solution for ACLS which can Identify toxidromes.
68.	<b>HL – CM – 19</b>	Various medical procedures need training and manikins before doing it on patients. Design and develop a low cost task trainers for procedural skills.
69.	<b>HL – JI – 01</b>	<p>Fetal Hear Rate (FHR) and Uterine contractions (UC) are two vital parameters that requires continuous monitoring during the intrapartum period. These two parameters are used to detect fetal distress conditions.</p> <p>Cardiotocograph is the most widely used tool for monitoring FHR and UC. It gives output in a graphical format which is interpreted by healthcare professionals to detect fetal distress cases. There are various guidelines related to interpretation of CTG such as NICE, ACOG, FIGO etc. Currently, these interpretations are subjective and vary from expert to expert and guidelines to guidelines.</p> <p><b>PhysioNet</b> offers free web access to large collections of recorded physiologic signals (PhysioBank) and related open-source software (PhysioToolkit). PhysioBank databases are made available under the ODC Public Domain Dedication and License v1.0. You are required to use Physionet database for your model development and testing. You can use CTU –CHB Intrapartum Cardiotocography Database (ctu – uhb – ctgdb) database from physiobank ATM for your development. The figure highlights the appropriate options for your use case. You are free to choose any format from the toolbox drop down menu as per your convenience. Following parameters are provided with each record and can be retrieved by respective header files.</p> <ol style="list-style-type: none"> <li>1. Maternal data: age; parity; gravidity;</li> <li>2. Delivery data: type of delivery (vaginal; operative vaginal; CS); duration of delivery; meconium stained fluid; type of measurement (i.e. ultrasound or direct scalp electrode);</li> <li>3. Fetal data: sex; birth weight;</li> <li>4. Fetal outcome data: analysis of umbilical artery blood sample (i.e. pH; pCO<sub>2</sub>; pO<sub>2</sub>; base excess and computed BDecf); Apgar score; neonatology evaluation (i.e. need for O<sub>2</sub>; seizures; admission to NICU)</li> </ol> <p><b>You should classify any record with a blood pH &lt; 7.1 as distress. The records having blood pH &gt; 7.1 can be classified as Normal.</b></p>
70.	<b>HL – MV – 01</b>	<p><b>Intelligent Finger Prosthetics</b></p> <p>Prosthesis refers to artificial replacement of an absent part of the human body. These prostheses help in psychological support of the patients and enhance their social acceptance. Often people lost their finger during some</p>

		unfortunate accident. Finger amputation are most common kind of amputation. Develop an intelligent and low-cost finger prosthetics that can be used in day to day life.
71	<b>HL – MV – 02</b>	<p><b>VR Based Orthopaedic Surgical Guidance system.</b></p> <p>Orthopaedic Surgery are very complex and involves lot of precision. VR technology can be used to visualize complex medical data during surgery and to preoperatively plan surgical procedures. Design VR based orthopaedic guidance system that can be used during surgery giving maximum precision.</p>
<b>IOT &amp; AUTOMATION</b>		
72.	<b>IA – BF – 01</b>	<p><b>Manoeuvring floating bots with single azimuth thruster on a water body along a given path by using IoT and GPS.</b></p> <p>A robotic platform needs to be maneuverer in a water body along predefined paths. Each aquatic bot has a single azimuth thruster for propulsion. It has to maintain required heading, speed and position accuracy to traverse along the path. The bots can communicate with each other without the need of a central server. Position log may be maintained at a central server if needed. The robotic platform, path information and other necessary information will be provided.</p> <p><b>The participants will have to integrate minimum number of sensors and develop the necessary algorithm to precisely follow a path.</b></p>
73.	<b>IA – II – 01</b>	<p><b>Design and develop an IoT based Electrical Machines condition monitoring with the following:</b></p> <ol style="list-style-type: none"> <li>1. Acquire the voltage, current, power, frequency, temperature &amp; vibration parameters using cRIO hardware.</li> <li>2. Design the web interface to visualise the data</li> <li>3. Monitor it remotely</li> <li>4. Secured interface ( login based )</li> <li>5. Required : cRIO + Modules + LabVIEW</li> </ol>
74.	<b>IA – II – 02</b>	<p><b>Design and develop an IoT based smart grid system with the following:</b></p> <ol style="list-style-type: none"> <li>1. The control should monitor the power utilization</li> <li>2. Depending on the power generation, it should dynamically control the load</li> <li>3. Single phase with 6 ~ 10 load can be arranged</li> <li>4. Load priority control</li> <li>5. Web access</li> <li>6. Required : cRIO + Modules + LabVIEW</li> </ol>
75.	<b>IA – II – 03</b>	<p><b>Design and develop an IoT based Home Automation using myRIO with the following:</b></p> <ol style="list-style-type: none"> <li>1. Acquire the status of the environment using IR sensor, temperature sensor and motion sensor</li> <li>2. Control the electrical equipment : Light, Fan</li> <li>3. Digital lock/PIN based door locking system</li> <li>4. Monitor and control all the equipment using Cloud</li> <li>5. Web page access to the user (login based)</li> <li>6. myRIO + LabVIEW + Sensors</li> </ol>
76.	<b>IA – II – 04</b>	<p><b>Design and develop an IoT Based room temperature monitoring system with the following:</b></p>



		<ol style="list-style-type: none"> <li>1. Measure the room temperature</li> <li>2. Use motion sensor to detect the number of persons in room</li> <li>3. Control the light &amp; fan/ac based on predefined rules</li> <li>4. Web access</li> <li>5. myRIO + LabVIEW + Sensors</li> </ol>
77.	<b>IA – SN – 01</b>	Using IoT to synthesize useful info from air-conditioning and refrigeration systems.
78.	<b>IA – SN – 02</b>	IoT based interaction system for drives to talk to other devices in a manufacturing site.
79.	<b>IA – SN – 03</b>	Development of Sensor based applications in agriculture/ irrigation.
80.	<b>IA – TM – 01</b>	Design and develop a solution for battery Parameters monitoring using IoT for Electric Vehicles
	<b>IA – SE – 01</b>	<p><b>Azure cloud based IOT application for solar plant monitoring</b></p> <p>To design an Azure cloud space based IoT application to view all solar plant data, analytics, historical performance, device comparison and energy source analysis, and site advanced analysis.</p> <p>KPI:</p> <ol style="list-style-type: none"> <li>1. The proposal should not cost more than 10USD per year per site</li> <li>2. There should not be any limitation or cap on daily data ingress</li> <li>3. The cloud should store data for 10 years</li> </ol>
	<b>IA – TE – 01</b>	<p><b>Distribution transformer monitoring using IoT</b></p> <p>Transformer are used for distribution purpose which convert the primary voltage so that it can be used in household. But often transformer develop fault which hamper its performance. Develop system which monitor several parameter such as current, temperature, rise and fall in oil level , vibration etc Using IOT.</p>
81.	<b>EM – AN – 01</b>	<p>Predicting failure of Uninterrupted Power supply (UPS) system Batteries are leading cause of UPS failures. Here are some of the critical inputs we capture and trend over the life of a battery:</p> <ol style="list-style-type: none"> <li>1. Battery Properties</li> <li>2. Environmental Conditions such as Room Temperature and Humidity</li> <li>3. Battery make and model</li> <li>4. Define maximum and average life based on UPS rating</li> <li>5. Frequency and depth of battery discharge in minutes and percentage</li> <li>6. Age of battery</li> <li>7. UPS load percentage</li> <li>8. Battery test results measuring voltage and resistance over time based on battery age <input type="checkbox"/> UPS operating mode</li> <li>9. UPS service history compared to similar UPSs with same battery make and model <input type="checkbox"/> UPS logic and battery alarms</li> <li>10. Battery inspection test results</li> <li>11. UPS application</li> </ol>

		<p>Using the above parameters capture through SCADA system and multiple instance learning algorithm to predict the failure of uninterrupted power supply accurately.</p> <p><b>Objective of the Project:</b></p> <ol style="list-style-type: none"> <li>1. Identifying the characteristics and challenges found in real-world sensor data from battery backup systems.</li> <li>2. Designing a tool that includes a pre-processing technique for removing noise and errors as well as estimating missing values while retaining all of the important information about the battery system.</li> <li>3. Building a Supervisory prediction model that can help facilitate the monitoring process by identifying that a given battery is approaching the end of its lifetime based only on previous readings and thus determining at a given time if a battery should be replaced or not.</li> </ol>
<b>ENERGY MANAGEMENT</b>		
82.	<b>EM – SM – 01</b>	<p><b>Communication between Smart meters and Multiple Smart sockets</b></p> <ol style="list-style-type: none"> <li>1. There is no internal communication between smart sockets and smart meters.</li> <li>2. In case of any sudden rise/drop in current value the output changes drastically and poses a threat to the connected appliances.</li> <li>3. Also there is a need of a feedback system to validate the total current of the smart sockets with that of the smart meter.</li> </ol> <p><b>Design an Algorithm/prototype for the same.</b></p>
83.	<b>EM – SL – 01</b>	<p><b>Over the Air Code Flash</b></p> <p>For all ECUs (Electronic circuit Unit) at the factory site code flashing is done by CAN protocol. But for those ECUs which do not have CAN but a wireless medium of Bluetooth flashing is difficult.</p> <p><b>Create a:</b></p> <ol style="list-style-type: none"> <li>1. HW prototype (Development Kit) with Bluetooth Interface and Mobile APK.</li> <li>2. Mobile APK will have facility to collect Hex file and send to controller on Bluetooth communication.</li> <li>3. A boot loader which will use this hex file to boot the system</li> </ol>
84.	<b>EM – ES - 01</b>	Charge – based self-equalization for imbalance battery pack in an energy storage management system. Develop a time based equalization algorithm.
85.	<b>EM – ES - 02</b>	Develop a Smart load node for non-smart load under smart grid paradigm – Home energy management system.
86.	<b>EM – PS – 01</b>	Develop a solution for IOT based solar plant monitoring (minimum two solar PV module needed to be considered) – PV modules electrical parameters (I,V) and weather parameters ( Temp, solar insolation and wind speed) are needed to be monitored from remote. Also include prediction and consumption statistics.
87.	<b>EM – PS – 02</b>	Remote <b>power quality and energy monitoring</b> for more than two power sub stations. Objective: Harmonics Monitoring, Voltage Sags well (DHT), Power factor Measurement, and any other relevant data.

88.	<b>EM – PS – 03</b>	Demonstration of <b>demand side management for a Micorgrid</b> with at least one renewable source and non-renewable resource.
89.	<b>EM – PS – 04</b>	<b>Condition monitoring and state of charge (SOC) estimation</b> of a battery energy storage system.
90.	<b>EM – PS – 05</b>	Develop a solution for CO2 footprint display for anyone power house/generation unit (EB supply + DG + solar PV + wind power).
	<b>EM – TE– 01</b>	<p><b>Transformer bursting out in hot summer.</b></p> <p>Electrical transformers transfer energy between circuits, switching energy from one voltage to another. But during extreme summer when temperature is very high it is highly likely that older transformers may explode because their insulating material may fall and other prominent factors. Develop a system that will prevent the bursting of transformer by analysing various factor responsible for the bursting of transformer.</p>
	<b>EM – TE– 02</b>	<p><b>Renewable penetrations and the reactive power values.</b></p> <p>The penetration of renewable energy into the electricity supply mix has been much in the news recently. Renewable penetration refers to percentage of electricity by particular renewable energy source. Develop a system to calculate renewable penetration and reactive power values. The developed system should also be able to tell power factor and correct it if the values are not tuned.</p>
	<b>EM – TE– 03</b>	<p><b>DC grid system with proper protective circuits.</b></p> <p>Design a grid system that can be used for the transfer of Dc supply from one place to another. The grid should contain required protective circuit to prevent the grid from any damage.</p>
<b>ARTIFICIAL INTELLIGENCE</b>		
91.	<b>AI – CC – 01</b>	<p><b>Proximity Marketing for Retail Stores</b></p> <p>It's a known fact that customers are becoming smarter and more demanding day by day. Thus it becomes necessary to bring the maximum amount of comfort to the customer by selling the right thing to the right customer. E- Commerce websites have been able to do this quite well by recommending and convincing the buyers what to buy based on their preferences by storing and analysing their historical purchase data. Hence to bridge the gap between e-commerce websites and the retail stores, implement smart and intelligent systems capable of generating insights from data produced by smart camera's to do proximity marketing. <b>Design model/prototype for the same.</b></p>
92.	<b>AI – SN – 01</b>	AI based Air-conditioning system for more effective or reduce unnecessary cooling

93.	<b>AI – SN – 02</b>	Machine learning based reduction of on-farm loss of pre Management
<b>SAFETY &amp; SECURITY</b>		
94.	<b>SS – CC – 01</b>	<p><b>Antidrone - Drone mechanism</b>  Recently there has been an increase in usage of drones for various activities. There have been cases where they enter private or restricted property. To neutralise such activity make a drone detection mechanisms. Whenever an unknown drone comes within the range of the anti-drone, it should be able to identify the intrusion and take preventive measures.  <b>Design model/prototype for the same.</b></p>
95.	<b>SS – ES - 01</b>	<p><b>Security Analysis of Smart Grids</b></p> <p>Threats: Security Group Knowledge  Information Leakage  Access Point  Unpatched System  Weak Cyber Security</p> <p>Safety Critical systems (SCS) in a security context</p> <p>Challenges:  Risk Modelling  Risk Mitigation  Cyber Attacks on power systems</p>
96.	<b>SS – ES – 02</b>	<p><b>Consumer trust through IoT</b></p> <p>Data and privacy – Getting consumers to trust products enabled by the Internet of Things.</p>
97.	<b>SS – ES – 03</b>	<p><b>Eco Security:</b> Tackling challenges related to data exchange and security.  - Data exchange architecture for the energy internet</p>
98.	<b>SS – ES - 04</b>	Multilevel watermark for protecting DSP kernel in CE system.
<b>EMERGING TECHNOLOGIES</b>		
99.	<b>ET – CC - 01</b>	<p><b>Visual Security System using fog computing</b></p> <p>Video cameras are now used in parking lots, buildings and other public and private spaces to increase public safety. The sheer bandwidth of visual (and other sensor) data being collected over a large-scale network makes it impractical to transport all of the data to the cloud to obtain real-time insights. Imagine a busy airport or city centre with many people and objects moving through an area at a time. Real-time monitoring and detection of anomalies pose strict low-latency requirements on surveillance systems. Timeliness is important for both detection and response.</p> <p>Privacy concerns must be addressed when using a camera as a sensor that collects image data so that the images do not reveal a person's identity or reveal confidential contextual information to any unauthorized parties. Fog computing</p>

		<p>allows for real-time, latency-sensitive distributed surveillance systems that maintain privacy.</p> <p>Through a fog architecture, video processing is intelligently partitioned between fog nodes co-located with cameras and the cloud. This enables real-time tracking, anomaly detection, and collection of insights from data captured over long intervals of time.</p> <p><b>Design model/prototype for the same.</b></p>
100.	<b>ET – CC – 02</b>	<p><b>Low power consumption assets tracking</b></p> <p>In today's time industries are getting smart and automated. To keep a track of all the assets it's a tedious task. Come up with a solution to track assets with a cheap / energy efficient way.</p> <p><b>Design a model/prototype for the same.</b></p>
101.	<b>ET – SN – 01</b>	Expiry date detection of products stored in supermarket without checking them physically.
102.	<b>ET – SN – 02</b>	Use of augmented Reality in automobiles for safety assistance system and products
103.	<b>ET – VD – 01</b>	Design and develop a solution for blister Level monitoring in the Furnace.
104.	<b>ET – BM – 01</b>	<p><b>Fruit spoilage or defect detection through image processing techniques using MATLAB/Python/C++</b></p> <p>To detect and conclude if a fruit has been spoilt/ damaged/ diseased, using image processing techniques and ensuring high accuracy by incorporating any novel algorithms and appropriate concepts of machine learning and neural networks.</p>
105.	<b>ET – BS – 01</b>	<p><b>Measuring the nutrient values in vegetable, fruits and cereals.</b></p> <p>In light of the recent technological advancements, the demand for improved nutrient value of vegetables, fruits and cereals has exponentially increased. Thus, enhancing the probability of improvement in sectors like horticulture. Currently technologies like dielectric spectroscopy and advanced dielectric sensing are being used to monitor and measure the nutrient values. Propose an idea to build an innovative, cost and energy efficient tech to measure the nutrient values in vegetables, fruits and cereals.</p>
106.	<b>ET – BS – 02</b>	<p><b>Quantification of water flowing through tributaries and rivers using wireless sensors networks.</b></p> <p>India has pure water resources like rivers, tributaries and distributaries in abundance but a lot of water is not used efficiently every year due to the lack of monitoring technologies. The demand for water in various sectors like agriculture, horticulture, manufacturing, etc. Develop an innovative, intelligent and adaptive monitoring system that is cost and energy efficient for on-line remote quantization of the water flow and water quality to boost the efficient utility of water.</p>

107.	<b>ET – ES - 01</b>	Design a block chain – based IoT system with Ethereum, Swarm and LoRa. High availability with minimum security risks.
108.	<b>ET – FM – 01</b>	<p><b>Improving the current system of patent search.</b></p> <p>The current procedure followed by anyone interested in applying for a new patent involves writing an application and then sharing it with a patent professional who will raise objections on the novelty of the idea/invention. Many of the applications get rejected or consume a lot of time clearing these objections before being successfully accepted. The government of India has a dedicated portal for searching through granted patents. Come up with an innovative solution helping the applicants to search through these granted patents more effectively and detecting similarity with any of the existing patents(if any) to avoid later complications. Also, don't restrict yourself to the above problem, surprise us with anything innovative in the same sector.</p>
109.	<b>ET – FM – 02</b>	<p><b>Innovation in LegalTech</b></p> <p>The government of India has instructed all courts/tribunals to digitize daily proceedings and publish them online. Come up with an interesting solution leveraging this data, solving problems or giving more insights from the data to help advocates, law students better understand law or assisting them in their daily work.</p>
110.	<b>ET - SE - 01</b>	<p><b>Design of proof concept module.</b></p> <p>Design a Proof of Concept module to fetch data from Azure data lake and present in UI within &lt;4 sec time. the user data should be 100 data point per page</p>