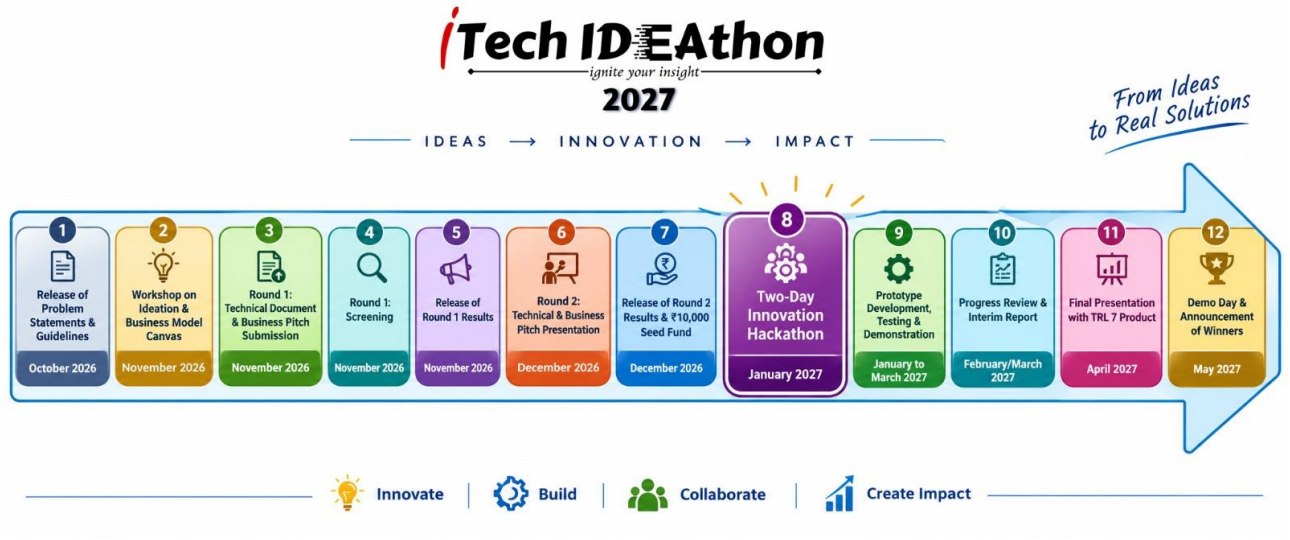
iTech IDEAthon

ignite your insight

2027



Problem Statements for Students

Ideas → Innovation → Impact | From Ideas to Real Solutions

Welcome, innovators

The Ideathon invites student teams to turn ideas into working solutions for real engineering and societal challenges. This booklet lists 14 problem statements, each mapped to the UN Sustainable Development Goals (SDGs), plus an Open Problem Statement for teams who want to tackle a problem of their own choosing.

How to use this booklet

- Read the summary table and shortlist the problems that interest you.
- Choose one problem statement, or propose your own through the Open Problem Statement (PS 15).
- Each problem is a starting point, not a fixed specification. Define a specific problem within it and build a proof of concept (PoC) that addresses it.
- Plan to demonstrate and evaluate your PoC. Every problem lists the outcomes that evaluators will look for.

Programme timeline

Stage	Activity	When
1	Release of Problem Statements & Guidelines	October 2026
2	Workshop on Ideation & Business Model Canvas	November 2026
3	Round 1: Technical Document & Business Pitch Submission	November 2026
4	Round 1: Screening	November 2026
5	Release of Round 1 Results	November 2026
6	Round 2: Technical & Business Pitch Presentation	December 2026
7	Release of Round 2 Results & ₹10,000 Seed Fund	December 2026
8	Two-Day Innovation Hackathon	January 2027
9	Prototype Development, Testing & Demonstration	January to March 2027
10	Progress Review & Interim Report	February/March 2027
11	Final Presentation with Product	April 2027
12	Demo Day & Announcement of Winners	May 2027

Problem statements at a glance

No.	Problem statement	SDGs
PS 01	Intelligent Autonomous Cargo Handling and Navigation for Logistics Facilities	8, 9, 11
PS 02	Autonomous Agricultural Assistant for Small and Medium Farms	2, 9, 12
PS 03	Predictive Maintenance and Utility Dashboard for Industrial Equipment	8, 9, 12
PS 04	Smart Structural Health Monitoring and Infrastructure Digital Twin	9, 11
PS 05	Autonomous Robot for Drainage and Sewer Inspection	6, 9, 11
PS 06	Intelligent EV Battery Monitoring and Charging Safety	7, 9, 11
PS 07	Intelligent Manufacturing Inspection and Defect Identification	8, 9, 12
PS 08	Solar Rooftop Potential Assessment, Inspection and Maintenance Support	7, 9, 11, 13
PS 09	Autonomous Underwater Inspection and Environmental Monitoring Vehicle	6, 9, 14
PS 10	Greywater Treatment, Monitoring and Reuse	6, 11, 12
PS 11	Rail-Defect Screening and Track-Condition Monitoring	9, 11
PS 12	Energy-Efficient Operation of Small Electric Drives	7, 9, 12
PS 13	Automated Waste Segregation and Material Recovery	11, 12, 13
PS 14	Autonomous Aerial Inspection for Agriculture and Infrastructure	2, 9, 11, 13
PS 15	Open Problem Statement: Your Idea, Your Problem	Any relevant SDGs

Problem statements

PS 01 | Intelligent Autonomous Cargo Handling and Navigation for Logistics Facilities

Mapped SDGs: SDG 8 – Decent Work and Economic Growth; SDG 9 – Industry, Innovation and Infrastructure; SDG 11 – Sustainable Cities and Communities

The problem

Cargo terminals, warehouses, yards and logistics facilities struggle with material movement, inventory visibility, operational delays, workplace safety and resource utilisation. Manual handling and fragmented monitoring reduce productivity and increase the risk of errors and accidents. Autonomous robots can help, but they must cope with obstacles, restricted pathways, changing surroundings and uncertain sensor information, all of which affect navigation reliability and operational safety.

Your challenge

Develop an intelligent autonomous system that improves the efficiency, safety or coordination of cargo handling in a defined operating environment. The system should perceive its surroundings, move through a constrained space and respond appropriately when conditions change.

Key considerations

- Material movement and inventory visibility
- Safety of people, equipment and cargo
- Different operating environments (terminal, warehouse, yard)
- Obstacle handling and changing surroundings
- Uncertain or noisy sensor information
- Navigation safety constraints and repeatability

Expected outcomes

- A working proof of concept (PoC) for a clearly identified cargo-handling or logistics problem, including autonomous movement or navigation in a representative environment
- Demonstration under representative operating conditions, using a physical platform, scaled environment or suitable simulation
- Evaluation of efficiency, safety, reliability or resource utilisation, together with navigation success, obstacle handling and repeatability
- Evidence of feasibility for deployment in a relevant logistics environment, with safety constraints and conditions needing further testing identified

PS 02 | Autonomous Agricultural Assistant for Small and Medium Farms

Mapped SDGs: SDG 2 – Zero Hunger; SDG 9 – Industry, Innovation and Infrastructure; SDG 12 – Responsible Consumption and Production

The problem

Farmers need timely information on crop condition, soil characteristics, irrigation needs, weeds and other field-level variations. Small and medium farms often cannot afford automation and precision-farming technologies.

Your challenge

Build an affordable system that monitors or supports a specific agricultural task on small and medium farms.

Key considerations

- Affordability for small and medium farms
- Varying terrain and environmental conditions
- Practical farm requirements and ease of use

Expected outcomes

- A PoC demonstrating a specific agricultural task or field-monitoring capability
- Validation using representative crops, soil conditions, field data or a suitable test environment
- Assessment of usability, reliability and resource efficiency
- Documentation of applicability to small and medium farms

PS 03 | Predictive Maintenance and Utility Dashboard for Industrial Equipment

Mapped SDGs: SDG 8 – Decent Work and Economic Growth; SDG 9 – Industry, Innovation and Infrastructure; SDG 12 – Responsible Consumption and Production

The problem

Unexpected failures in motors, pumps, compressors and other industrial equipment cause downtime, maintenance costs, production losses and safety concerns. Fixed maintenance schedules often do not reflect the actual condition of the equipment. Facilities also lack a single view that links equipment condition with utility consumption such as electricity, water and compressed air, which makes it hard to spot waste and prioritise maintenance.

Your challenge

Use equipment-condition information to identify abnormal behaviour, assess degradation and support better maintenance decisions. Present the results, together with utility consumption, on a utility dashboard that operators and maintenance teams can use.

Key considerations

- Source of condition data (sensors, lab setup, recorded data)
- Balance between detection accuracy and false alarms
- Response time and usefulness for maintenance planning
- Utility dashboard design: clear display of equipment health, alerts and utility usage (electricity, water, compressed air)

Expected outcomes

- A working PoC for equipment-condition assessment or early detection of abnormal behaviour
- A utility dashboard that shows equipment condition, alerts and utility-consumption trends in a form operators and maintenance planners can act on
- Validation using measured data, a laboratory setup, recorded operating data or controlled fault conditions
- Performance evaluation using indicators such as detection accuracy, false alarms and response time
- Assessment of the potential to reduce unplanned downtime, cut utility waste or improve maintenance planning

PS 04 | Smart Structural Health Monitoring and Infrastructure Digital Twin

Mapped SDGs: SDG 9 – Industry, Innovation and Infrastructure; SDG 11 – Sustainable Cities and Communities

The problem

Buildings, bridges and other civil infrastructure face ageing, environmental stress, repeated loading and unexpected events. Detecting deterioration before it becomes critical is essential for public safety and infrastructure management.

Your challenge

Assess the condition of a structure over time and present the information in a form that supports inspection, interpretation and maintenance decisions.

Key considerations

- Choice of structure, specimen, simulated data or real dataset
- Clear presentation of structural-condition information
- Identifying significant changes over time

Expected outcomes

- A PoC for monitoring or assessing a selected structural or infrastructure condition
- Demonstration using a model structure, laboratory specimen, simulated data or a suitable real-world dataset
- A way to present structural-condition information and flag potentially significant changes
- Evaluation of limitations, reliability and suitability for further testing

PS 05 | Autonomous Robot for Drainage and Sewer Inspection

Mapped SDGs: SDG 6 – Clean Water and Sanitation; SDG 9 – Industry, Innovation and Infrastructure; SDG 11 – Sustainable Cities and Communities

The problem

Drainage and sewer networks develop blockages, cracks, sediment build-up, corrosion and other defects that are hard to inspect manually. Confined spaces, hazardous gases, poor visibility and restricted access put maintenance workers at risk.

Your challenge

Develop a way to assess the condition of drainage infrastructure and locate maintenance needs while reducing human exposure to hazardous environments.

Key considerations

- Confined spaces and limited visibility
- Detecting and recording defects and obstructions
- Practical constraints of real drainage networks

Expected outcomes

- A PoC demonstrating inspection or condition assessment in a representative drainage environment
- Identification or recording of relevant defects, obstructions or abnormal conditions
- Demonstration in a test section that represents selected field constraints
- Evaluation of inspection coverage, reliability and deployment challenges

PS 06 | Intelligent EV Battery Monitoring and Charging Safety

Mapped SDGs: SDG 7 – Affordable and Clean Energy; SDG 9 – Industry, Innovation and Infrastructure; SDG 11 – Sustainable Cities and Communities

The problem

Electric vehicle batteries must operate within safe electrical and thermal limits. Differences in battery condition, charging behaviour, cell imbalance and temperature affect performance, service life and safety.

Your challenge

Assess battery operating information to improve visibility of battery condition, identify abnormal behaviour and support safer charging and utilisation.

Key considerations

- Cell imbalance, temperature and charging behaviour
- Accuracy and responsiveness of monitoring
- Safety considerations before any real deployment

Expected outcomes

- A PoC for battery-condition monitoring or identification of selected abnormal operating conditions
- Validation using a battery test setup, battery simulator or representative data
- Assessment of the accuracy and responsiveness of the monitoring approach
- Documentation of safety considerations and limitations before practical deployment

PS 07 | Intelligent Manufacturing Inspection and Defect Identification

Mapped SDGs: SDG 8 – Decent Work and Economic Growth; SDG 9 – Industry, Innovation and Infrastructure; SDG 12 – Responsible Consumption and Production

The problem

Manufacturers must detect defects, dimensional deviations, assembly errors and material inconsistencies without slowing production. Manual inspection is time-consuming and can be inconsistent, especially when products or operating conditions vary.

Your challenge

Improve defect identification, quality assessment and inspection consistency for a clearly defined manufacturing process.

Key considerations

- Variation in product appearance and operating conditions
- Repeatability and error rates
- Impact on throughput and material waste

Expected outcomes

- A PoC for a clearly defined manufacturing inspection or quality-control task
- Demonstration using representative products, samples, images or test data
- Evaluation of inspection performance, repeatability and relevant error rates
- Assessment of the potential to improve quality assurance and reduce avoidable waste

PS 08 | Solar Rooftop Potential Assessment, Inspection and Maintenance Support

Mapped SDGs: SDG 7 – Affordable and Clean Energy; SDG 9 – Industry, Innovation and Infrastructure; SDG 11 – Sustainable Cities and Communities; SDG 13 – Climate Action

The problem

Getting the most from solar power is difficult before and after installation. Before installation, the suitability of a rooftop depends on roof geometry, orientation, shading, available area and local solar conditions, and assessing these factors for individual buildings or entire urban areas is resource-intensive. After installation, solar systems lose output due to dust, shading, damaged modules, electrical faults and other factors, and inspecting large or hard-to-reach installations takes considerable time and effort.

Your challenge

Develop a solution that helps plan, inspect or maintain solar power on buildings: estimate rooftop solar potential, assess the condition of an installed system, identify performance-related issues and support timely maintenance without compromising safety or equipment integrity. Teams may focus on one part of this chain or link both, and should communicate findings clearly to building owners, planners, operators or energy stakeholders.

Key considerations

- Data sources (building geometry, imagery, solar data, measurements) and clearly documented assumptions
- Identifying and classifying conditions that reduce performance
- Safety of personnel and equipment
- Prioritising maintenance for the greatest energy-yield benefit
- Usefulness of results for solar planning and operation

Expected outcomes

- A PoC for assessing the solar potential of selected buildings, or for inspection, condition assessment or maintenance prioritisation in a representative solar installation (or both)
- Demonstration using building geometry, solar data, imagery, physical measurements, a panel test setup, a simulated installation or operational data
- Estimates of installable area or energy generation with assumptions documented, and/or identification or classification of selected conditions that affect performance
- Evaluation of accuracy, inspection effectiveness, practical constraints and potential energy-yield benefits

PS 09 | Autonomous Underwater Inspection and Environmental Monitoring Vehicle

Mapped SDGs: SDG 6 – Clean Water and Sanitation; SDG 9 – Industry, Innovation and Infrastructure; SDG 14 – Life Below Water

The problem

Underwater environments, reservoirs, water tanks and coastal ecosystems need inspection for structural defects, sediment accumulation, water-quality changes and environmental disturbance. Poor visibility, currents, communication limits and risks to human divers make this difficult.

Your challenge

Collect useful underwater information and assess selected conditions in a controlled or representative aquatic environment.

Key considerations

- Limited visibility and water currents
- Communication and control underwater
- Stability and repeatability of observations

Expected outcomes

- A PoC demonstrating an underwater inspection, observation or environmental-monitoring task
- Validation in a water tank, pool or other controlled aquatic environment
- Collection and interpretation of relevant observations or measurements
- Evaluation of stability, repeatability, coverage and constraints for future field trials

PS 10 | Greywater Treatment, Monitoring and Reuse

Mapped SDGs: SDG 6 – Clean Water and Sanitation; SDG 11 – Sustainable Cities and Communities; SDG 12 – Responsible Consumption and Production

The problem

Water from bathing, handwashing and laundry offers a major reuse opportunity once suitably treated. However, varying contaminants, treatment needs, storage conditions and intended uses limit safe reuse.

Your challenge

Assess, treat or manage greywater so that its reuse potential can be evaluated for appropriate non-potable applications.

Key considerations

- Variation in contaminants and intended use
- Water-quality indicators before and after treatment
- Storage, operation and environmental considerations

Expected outcomes

- A PoC demonstrating a selected greywater assessment, treatment or reuse process
- Evaluation using representative greywater or a controlled test mixture
- Measurement of relevant water-quality indicators before and after the process
- Assessment of reuse suitability, operational requirements and environmental impact

PS 11 | Rail-Defect Screening and Track-Condition Monitoring

Mapped SDGs: SDG 9 – Industry, Innovation and Infrastructure; SDG 11 – Sustainable Cities and Communities

The problem

Railway infrastructure faces repeated mechanical loading, environmental effects and material degradation. Defects, wear and changes in track condition can affect safety and reliability if not identified in time.

Your challenge

Assess selected rail or track conditions, detect abnormal indications and support inspection prioritisation.

Important: any prototype must be evaluated in a controlled environment and must not be treated as a substitute for certified railway safety inspection.

Key considerations

- Distinguishing normal from abnormal conditions
- Detection consistency
- Requirements for further safety validation

Expected outcomes

- A PoC for identifying or assessing a selected rail or track-condition indicator
- Validation using test specimens, controlled measurements or representative datasets
- Evaluation of detection consistency and the ability to separate normal from abnormal conditions
- Assessment of potential inspection applications and the further safety validation needed

PS 12 | Energy-Efficient Operation of Small Electric Drives

Mapped SDGs: SDG 7 – Affordable and Clean Energy; SDG 9 – Industry, Innovation and Infrastructure; SDG 12 – Responsible Consumption and Production

The problem

Electric drives in pumps, fans, conveyors and small machines consume energy according to load, speed, control method and mechanical condition. Inefficient operation and unnecessary running raise energy costs and equipment stress.

Your challenge

Identify the factors that drive energy consumption in a drive system and improve efficiency without compromising required performance.

Key considerations

- Load, speed, control method and mechanical condition
- A clearly defined baseline for comparison
- Trade-offs between energy saving and performance

Expected outcomes

- A PoC addressing an identified drive-system efficiency or energy-management problem
- Measurement of electrical input and relevant mechanical or operational performance
- Comparison against a clearly defined baseline under comparable operating conditions
- Assessment of energy-saving potential, performance trade-offs and feasibility

PS 13 | Automated Waste Segregation and Material Recovery

Mapped SDGs: SDG 11 – Sustainable Cities and Communities; SDG 12 – Responsible Consumption and Production; SDG 13 – Climate Action

The problem

Mixed waste contains recyclable, biodegradable, hazardous and residual materials. Poor segregation reduces material recovery, raises processing costs and creates environmental and occupational hazards. Waste composition also differs between households, campuses, commercial facilities and industrial sites.

Your challenge

Improve waste identification, segregation or recovery in a defined waste-management context.

Key considerations

- Throughput and contamination
- Variation in waste composition across settings
- Operating constraints and safety requirements

Expected outcomes

- A PoC for a clearly defined waste-segregation or material-recovery task
- Demonstration using representative waste samples or a controlled test stream
- Evaluation of segregation effectiveness, contamination and processing performance
- Assessment of resource-recovery potential, feasibility and safety requirements

PS 14 | Autonomous Aerial Inspection for Agriculture and Infrastructure

Mapped SDGs: SDG 2 – Zero Hunger; SDG 9 – Industry, Innovation and Infrastructure; SDG 11 – Sustainable Cities and Communities; SDG 13 – Climate Action

The problem

Agricultural fields, industrial sites and infrastructure assets need periodic inspection for damage, deterioration and maintenance needs. Manual inspection of large, elevated or inaccessible locations is slow and difficult. Aerial platforms can help, but their usefulness depends on the inspection goal, data quality, operating environment and safety requirements.

Your challenge

Show how aerial observations can support a clearly defined inspection or monitoring task.

Key considerations

- A clear inspection objective
- Data quality and coverage
- Safety constraints and applicable regulations

Expected outcomes

- A PoC demonstrating an aerial inspection or observation task for a selected application
- Validation in a controlled flight environment, suitable test area or with representative aerial data
- Demonstration of how the collected information supports identification or assessment of conditions
- Evaluation of coverage, data quality, safety constraints and feasibility

Open problem statement

PS 15 | Open Problem Statement: Your Idea, Your Problem

Overview

Not every important problem fits a list. If your team has spotted a real, unsolved problem that matters to people, industry, society or the environment, you are welcome to propose it as your own problem statement. It can fall in any engineering or technology domain, including areas not covered by the problem statements above.

Your challenge

Identify a real-world problem, justify why it matters, and design and demonstrate a technically sound solution as a proof of concept.

Questions your proposal should answer

- Who is affected by the problem, and how serious is it?
- Which UN Sustainable Development Goals (SDGs) does it support?
- Can a working PoC realistically be built and tested within the programme timeline?
- What makes your approach better than existing solutions?

Expected outcomes

- A clear problem definition, supported by evidence or observation from the field
- A working PoC, with validation using a test setup, simulation or representative data
- Evaluation of performance, reliability, feasibility and limitations
- A mapping to relevant SDGs, with a note on potential impact and the path to a market-ready product