ASME TN-NOVATE 2025

HACKATHON TRACK

GENERAL GUIDELINES FOR ALL PROBLEM STATEMENTS

EVALUATION CRITERIA

1. **Innovation & Creativity** (25%): Unique approach and novel features
2. **Technical Excellence** (25%): Code quality, architecture, and scalability
3. **Impact & Feasibility** (20%): Potential real-world impact and implementation viability
4. **User Experience** (15%): Interface design and user-friendliness
5. **Presentation** (15%): Clear communication and demonstration

COMMON REQUIREMENTS

- **Team Size:** 3 members
- **Presentation:** 10-minute demo showcasing solution functionality
- **Version Control:** Git/GitHub for code management

RESOURCES PROVIDED

- Mentorship from faculty members
- Technical support for development environment
- Access to relevant datasets and APIs
- Pre-hackathon workshops on domain knowledge

PROBLEM STATEMENT DISTRIBUTION

- **Hardware Statements : 03**
- **Software Statements: 17**

Each team should select ONE problem statement from any SDG that aligns with their interests and technical capabilities.

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Complete Problem Statement Collection - All SDGs

SDG 1: NO POVERTY

Problem ID: NOV-S001
Title: AI-Based Smart Allocation Engine for PM Internship Scheme
Category: Software
Organization: Ministry of Corporate Affairs

PROBLEM DESCRIPTION

The PM Internship Scheme aims to provide opportunities to youth, but efficient allocation of internships based on skills, location, and organizational requirements remains challenging. Current manual processes lead to mismatches and inefficient resource utilization.

CHALLENGE STATEMENT

Background
The PM Internship Scheme enables students to gain industry exposure through structured internships. However, matching thousands of applicants with the most suitable opportunities remains a challenge, often leading to suboptimal selections and delays.

Description
The problem envisages a smart, automated system that uses AI/ML algorithms to match candidates with internship opportunities based on skills, qualifications, location preferences, and sector interests. The system should also account for affirmative action (e.g., representation from rural/aspirational districts, different social categories), past participation, and internship capacity of industries.

Expected Solution
A functional prototype with:
• AI-based matchmaking engine for internship placement
• A prototype of the front end demonstrating how this engine will work

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SDG 2: ZERO HUNGER

Problem ID: NOV-S002
Title: Smart Crop Advisory System for Small and Marginal Farmers
Category: Software
Organization: Government of Punjab

PROBLEM DESCRIPTION

Small and marginal farmers lack access to timely, accurate agricultural advice, leading to suboptimal crop selection, poor yield, and economic losses. Traditional extension services have limited reach and personalization capabilities.

CHALLENGE STATEMENT

Problem Description:

A majority of small and marginal farmers in India rely on traditional knowledge, local shopkeepers, or guesswork for crop selection, pest control, and fertilizer use. They lack access to personalized, real-time advisory services that account for soil type, weather conditions, and crop history. This often leads to poor yield, excessive input costs, and environmental degradation due to overuse of chemicals. Language barriers, low digital literacy, and absence of localized tools further limit their access to modern agri-tech resources.

Impact / Why this problem needs to be solved

Helping small farmers make informed decisions can significantly increase productivity, reduce costs, and improve livelihoods. It also contributes to sustainable farming practices, food security, and environmental conservation. A smart advisory solution can empower farmers with scientific insights in their native language and reduce dependency on unreliable third-party advice.

Expected Outcomes

- A multilingual, AI-based mobile app or chatbot that provides real-time, location-specific crop advisory.
- Soil health recommendations and fertilizer guidance.
- Weather-based alerts and predictive insights.
- Pest/disease detection via image uploads.
- Market price tracking.
- Voice support for low-literate users.
- Feedback and usage data collection for continuous improvement.

Relevant Stakeholders / Beneficiaries

- Small and marginal farmers
- Agricultural extension officers

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SETTING THE STANDARD
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- Government agriculture departments
- NGOs and cooperatives
- Agri-tech startups

Supporting Data

- 86% of Indian farmers are small or marginal (NABARD Report, 2022).
- Studies show ICT-based advisories can increase crop yield by 20–30%.

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SDG 3: GOOD HEALTH AND WELL-BEING

Problem ID: NOV-S003
Title: Smart Community Health Monitoring and Early Warning System for Water-Borne Diseases in Rural Northeast India
Category: Software
Organization: Ministry of Development of North Eastern Region

PROBLEM DESCRIPTION

Rural Northeast India faces recurring outbreaks of water-borne diseases due to inadequate monitoring systems, delayed response mechanisms, and limited healthcare infrastructure.

CHALLENGE STATEMENT

Problem Statement

This problem statement proposes the development of a Smart Health Surveillance and Early Warning System that can detect, monitor, and help prevent outbreaks of water-borne diseases in vulnerable communities. The system can be:

- Collect health data from local clinics, ASHA workers, and community volunteers via mobile apps or SMS.
- Use AI/ML models to detect patterns and predict potential outbreaks based on symptoms, water quality reports, and seasonal trends.
- Integrate with water testing kits or IoT sensors to monitor water source contamination (e.g., turbidity, pH, bacterial presence).
- Provide real-time alerts to district health officials and local governance bodies.
- Include a multilingual mobile interface for community reporting and awareness campaigns.
- Offer dashboards for health departments to visualize hotspots, track interventions, and allocate resources.

Background

Water-borne diseases such as diarrhea, cholera, typhoid, and hepatitis A are prevalent in many rural areas and tribal belts of the Northeastern Region (NER), especially during the monsoon season. These outbreaks are often linked to contaminated water sources, poor sanitation infrastructure, and delayed medical response. The terrain and remoteness of many villages make it difficult for health workers to monitor and respond to emerging health threats in time.

Expected Solution

A digital health platform that includes:

- A mobile app for data collection and community health reporting.

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- AI-based outbreak prediction engine using health and environmental data.
- Integration with low-cost water quality sensors or manual test kits.
- Alert system for health authorities and local leaders.
- Educational modules for hygiene awareness and disease prevention.
- Offline functionality and support for tribal languages.

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SDG 4: QUALITY EDUCATION

Problem ID: NOV-S004
Title: Digital Learning Platform for Rural School Students in Nabha
Category: Software
Organization: Government of Punjab

PROBLEM DESCRIPTION

Rural schools in Nabha face challenges with limited qualified teachers, inadequate learning resources, and poor connectivity, affecting the quality of education delivered to students.

CHALLENGE STATEMENT

Problem Description

Many government schools in Nabha and nearby rural areas lack updated computer infrastructure, reliable internet connectivity, and access to quality digital educational resources. Teachers and students struggle to use outdated systems, and digital literacy remains low. As a result, students face difficulties in learning essential digital skills and accessing modern educational content, leading to a widening gap between rural and urban education standards.

Impact / Why this problem needs to be solved

The lack of digital resources and skills limits students' academic growth and future employability. With the increasing importance of digital literacy, students in rural Nabha risk being left behind, perpetuating cycles of educational and economic disadvantage. Addressing this problem is urgent to ensure equitable access to quality education and to empower rural youth with skills for the modern world.

Expected Outcomes

- A mobile and web-based digital learning app that works offline.
- Interactive lessons in local languages to improve engagement.
- Digital literacy modules tailored for rural students.
- Teacher dashboards to track student progress.
- Optimized for low-end devices and poor connectivity.

Relevant Stakeholders / Beneficiaries

- Rural school students and teachers in Nabha.
- School administrators.
- Parents.

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SDG 5: GENDER EQUALITY

Problem ID: NOV-S005
Title: Digital Mental Health and Psychological Support System for Students in Higher Education
Category: Software
Organization: Government of Jammu and Kashmir

PROBLEM DESCRIPTION

Students in higher education, particularly female students, face mental health challenges including stress, anxiety, and depression, with limited access to professional psychological support services.

CHALLENGE STATEMENT

Create a digital mental health platform that:

- Provides confidential psychological counseling services

- Offers self-assessment tools and mood tracking

- Includes crisis intervention and emergency support

- Delivers personalized mental wellness programs

- Ensures privacy and data security for sensitive information

EXPECTED DELIVERABLES

- Secure web and mobile application

- AI-powered mood analysis and recommendations

- Video counseling and chat support features

- Crisis detection and alert mechanisms

- Analytics dashboard for institutional mental health insights

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SDG 6: CLEAN WATER AND SANITATION

Problem ID: NOV-S006
Title: Application for On-Spot Assessment of Rooftop Rainwater Harvesting and Artificial Recharge Potential
Category: Software
Organization: Ministry of Jal Shakti

PROBLEM DESCRIPTION

Effective rainwater harvesting requires accurate assessment of rooftop potential and artificial recharge capabilities, but current methods are time-consuming and lack precision.

CHALLENGE STATEMENT

Develop an assessment application that:

- Calculates rainwater harvesting potential using satellite imagery

- Assesses artificial groundwater recharge feasibility

- Provides cost-benefit analysis for implementation

- Generates technical specifications for harvesting systems

- Includes AR-based visualization for property owners

EXPECTED DELIVERABLES

- Mobile application with camera-based measurements

- Satellite imagery integration and analysis

- Cost estimation and ROI calculators

- Technical drawing and specification generator

- Government dashboard for policy planning

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SDG 7: AFFORDABLE AND CLEAN ENERGY

Problem ID: NOV-H001
Title: Renewable Energy Monitoring System for Microgrids
Category: Hardware
Organization: Government of Odisha

PROBLEM DESCRIPTION

Microgrids with renewable energy sources lack comprehensive monitoring systems, leading to inefficient energy distribution, maintenance issues, and suboptimal performance.

CHALLENGE STATEMENT

Design a monitoring system that:

- Tracks real-time energy generation and consumption

- Predicts maintenance requirements and system failures

- Optimizes energy distribution across the microgrid

- Provides remote monitoring and control capabilities

- Integrates with smart grid technologies

EXPECTED DELIVERABLES

- IoT sensor network for energy monitoring

- Real-time data analytics and visualization platform

- Predictive maintenance algorithms

- Mobile app for system operators

- Integration APIs for existing energy management systems

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SDG 8: DECENT WORK AND ECONOMIC GROWTH

Problem ID: NOV-S007
Title: Smart Digital Platform to Promote Eco & Cultural Tourism in Jharkhand
Category: Software
Organization: Government of Jharkhand

PROBLEM DESCRIPTION

Jharkhand's rich cultural heritage and natural beauty remain underexplored due to lack of comprehensive digital promotion and tourist facilitation systems.

CHALLENGE STATEMENT

Create a tourism platform that:

- Showcases eco-tourism and cultural destinations

- Provides personalized trip planning and recommendations

- Facilitates booking of accommodations and local services

- Supports local artisans and service providers

- Includes augmented reality for enhanced tourist experiences

EXPECTED DELIVERABLES

- Comprehensive tourism web and mobile platform

- AR-enabled destination exploration features

- Integrated booking and payment systems

- Local vendor and artisan marketplace

- Tourism analytics and feedback management system

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SDG 9: INDUSTRY, INNOVATION AND INFRASTRUCTURE

Problem ID: NOV-H002
Title: AI based development of Laser based QR Code marking on 'track fittings on Indian Railways'.
Category: Hardware
Organization: Ministry of Railways

PROBLEM DESCRIPTION

Background

Indian Railways procures about 10 crore Elastic Rail Clips, 5 crore liners, and 8.5 crore rail pads annually. There is currently no system for identification of these track fittings—i.e., elastic rail clips, rail pads, liners—and sleepers, with integration to the UDM portal enabling mobile-based scanning for vendor lot number, date of supply, warranty period, inspection dates, etc. This gap is critical for quality assessment and performance management of fittings.

Description

This problem statement envisages a unified system for laser-based QR code marking on track fittings to enable mobile scanning and identification of elastic rail clips, rail pads, liners, and sleepers, along with integration to the UDM (User Depot Module) on www.ireps.gov.in and the TMS (Track Management System) on www.irecept.gov.in. With the use of AI, the system should extract all essential details of each fitting item, including inspections at all stages—from manufacturing and supply to in-service performance—and pinpoint exceptions for quality monitoring. Laser-based QR codes are already prevalent in other industries.

Expected Solution

Innovative solutions are invited through Smart India Hackathon 2025 to develop and implement a system addressing identification of bulk supply materials, their performance issues, and effective inventory management and quality monitoring actions for safety performance of fittings.

- **Hardware Solution**: Design and implement laser-based QR code imprints on bulk supply items of track fittings and sleepers.
- **Software Solution**: Develop QR code linkage and integrate with the UDM and TMS portals; enable mobile scans to generate AI-based reports related to vendor, supply, warranty, inspections, and support inventory management, etc.

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SDG 10: REDUCED INEQUALITIES

Problem ID: NOV-S008
Title: Telemedicine Access for Rural Healthcare in Nabha
Category: Software
Organization: Government of Punjab

PROBLEM DESCRIPTION

Rural areas in Nabha lack adequate healthcare services, with limited access to specialist doctors and medical facilities, creating health inequalities.

CHALLENGE STATEMENT

Build a telemedicine platform that:

- Connects rural patients with urban healthcare providers

- Supports video consultations and remote diagnosis

- Manages electronic health records and prescription systems

- Includes AI-powered initial symptom assessment

- Facilitates emergency medical consultation and referrals

EXPECTED DELIVERABLES

- Telemedicine web and mobile applications

- Secure video conferencing and file sharing

- Electronic health record management system

- AI-powered symptom checker and triage

- Integration with existing healthcare infrastructure

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SDG 11: SUSTAINABLE CITIES AND COMMUNITIES

Problem ID: NOV-S009
Title: Real-Time Public Transport Tracking for Small Cities
Category: Software
Organization: Government of Punjab

PROBLEM DESCRIPTION

Small cities lack efficient public transport tracking systems, leading to passenger inconvenience, route inefficiencies, and poor public transport utilization.

CHALLENGE STATEMENT

Create a transport tracking system that:

- Provides real-time bus location and arrival information

- Optimizes routes based on passenger demand and traffic

- Enables digital ticketing and payment solutions

- Includes passenger feedback and service quality monitoring

- Supports fleet management and driver coordination

EXPECTED DELIVERABLES

- Real-time tracking mobile application for passengers

- Fleet management dashboard for transport authorities

- Route optimization algorithms

- Digital payment integration

- Passenger feedback and analytics system

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SDG 12: RESPONSIBLE CONSUMPTION AND PRODUCTION

Problem ID: NOV-H003
Title: Waste Segregation Monitoring System for Urban Local Bodies
Category: Hardware
Organization: Government of Punjab

PROBLEM DESCRIPTION

Urban waste management suffers from poor segregation practices, leading to inefficient recycling, environmental pollution, and increased disposal costs.

CHALLENGE STATEMENT

Develop a monitoring system that:

- Automatically detects and sorts different types of waste

- Monitors segregation compliance at household and community levels

- Provides real-time data on waste generation patterns

- Incentivizes proper waste segregation practices

- Integrates with existing waste collection systems

EXPECTED DELIVERABLES

- AI-powered waste detection and sorting hardware

- Mobile app for waste generators and collectors

- Compliance monitoring and reporting system

- Incentive management platform

- Analytics dashboard for urban planning authorities

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SDG 13: CLIMATE ACTION

Problem ID: NOV-S010
Title: Blockchain-Based Blue Carbon Registry and MRV System
Category: Software
Organization: Ministry of Earth Sciences

PROBLEM DESCRIPTION

Blue carbon ecosystems (mangroves, seagrass, salt marshes) require transparent monitoring, reporting, and verification (MRV) systems for carbon credit trading and conservation efforts.

CHALLENGE STATEMENT

Build a blockchain-based registry that:

- Records and verifies blue carbon sequestration data

- Enables transparent carbon credit trading

- Provides immutable records of conservation activities

- Supports satellite and IoT data integration

- Facilitates international carbon market participation

EXPECTED DELIVERABLES

- Blockchain-based carbon registry platform

- Satellite data integration and analysis tools

- Smart contracts for carbon credit trading

- MRV dashboard for regulatory authorities

- Mobile app for field data collection

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SDG 14: LIFE BELOW WATER

Problem ID: NOV-S011
Title: Integrated Platform for Crowdsourced Ocean Hazard Reporting and Social Media Analytics
Category: Software
Organization: Ministry of Earth Sciences

PROBLEM DESCRIPTION

Ocean hazards like oil spills, plastic pollution, and marine life threats often go undetected due to limited monitoring resources and delayed reporting mechanisms.

CHALLENGE STATEMENT

Create an integrated platform that:

- Crowdsources ocean hazard reporting from citizens and fishermen

- Analyzes social media for early hazard detection

- Provides real-time alerts to maritime authorities

- Tracks hazard response and mitigation efforts

- Educates coastal communities about marine conservation

EXPECTED DELIVERABLES

- Crowdsourcing mobile application with photo/video reporting

- Social media monitoring and analysis algorithms

- Real-time alert and notification system

- Response coordination dashboard for authorities

- Community engagement and education modules

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SDG 15: LIFE ON LAND

Problem ID: NOV-S012
Title: Identifying Taxonomy and Assessing Biodiversity from eDNA Datasets
Category: Software
Organization: Ministry of Earth Sciences

PROBLEM DESCRIPTION

Biodiversity assessment through environmental DNA (eDNA) sampling generates large datasets that require sophisticated analysis tools for accurate species identification and ecosystem health evaluation.

CHALLENGE STATEMENT

Develop a system that:

- Processes and analyzes large eDNA sequence datasets

- Identifies species and assesses biodiversity indices

- Provides ecosystem health monitoring capabilities

- Supports conservation planning and decision making

- Includes predictive modeling for biodiversity trends

EXPECTED DELIVERABLES

- eDNA data processing and analysis pipeline

- Species identification and biodiversity assessment tools

- Ecosystem health monitoring dashboard

- Conservation planning support system

- Predictive biodiversity modeling algorithms

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SDG 16: PEACE, JUSTICE AND STRONG INSTITUTIONS

Problem ID: NOV-S013
Title: Authenticity Validator for Academia
Category: Software
Organization: Government of Jharkhand

PROBLEM DESCRIPTION

Academic institutions face challenges with document forgery, fake certificates, and plagiarism, undermining the integrity of educational systems and creating unfair advantages.

CHALLENGE STATEMENT

Build an authenticity validation system that:

- Verifies academic documents and certificates using blockchain
- Detects plagiarism in research papers and assignments
- Provides secure digital credentialing solutions
- Enables inter-institutional verification of academic records
- Includes AI-powered fraud detection mechanisms

EXPECTED DELIVERABLES

- Blockchain-based document verification system
- Plagiarism detection and prevention tools
- Digital credential management platform
- Inter-institutional verification APIs
- Fraud detection and reporting mechanisms

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SDG 17: PARTNERSHIPS FOR THE GOALS

Problem ID: NOV-S014
Title: Digital Platform for Centralized Alumni Data Management and Engagement
Category: Software
Organization: Government of Punjab

PROBLEM DESCRIPTION

Educational institutions struggle to maintain connections with alumni, limiting opportunities for mentorship, career guidance, and institutional development support.

CHALLENGE STATEMENT

Create a comprehensive platform that:

- Centralizes alumni data across multiple institutions

- Facilitates networking and mentorship opportunities

- Enables career guidance and job placement services

- Supports fundraising and institutional development activities

- Provides analytics on alumni engagement and success metrics

EXPECTED DELIVERABLES

- Centralized alumni management platform

- Networking and mentorship matching system

- Career services and job portal integration

- Fundraising and donation management tools

- Analytics dashboard for institutional insights

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SDG 4: QUALITY EDUCATION

Problem ID: NOV-S015
Title: Smart Classroom & Timetable Scheduler
Category: Software
Organization: Government of Jharkhand

Background
Higher Education institutions often face challenges in efficient class scheduling due to limited infrastructure, faculty constraints, elective courses, and overlapping departmental requirements. Manual timetable preparation leads to frequent clashes in classes, underutilized classrooms, uneven workload distribution, and dissatisfied students and faculty members. With the increasing adoption of multidisciplinary curricula and flexible learning under NEP 2020, the class scheduling process has become more complex and dynamic, requiring intelligent and adaptive solutions.

Description
The current scheduling mechanism in most higher education institutes/colleges relies on manual input via spreadsheets or basic tools. These fail to account for real-time availability of faculty, room capacity, teaching load norms, subject combinations, and student preferences. A solution is required that will accommodate the various parameters required for scheduling classes for UG and PG students and return an optimized timetable ensuring:
• Maximized utilization of classrooms and laboratories
• Minimized workload on faculty members and students
• Achievement of required learning outcomes

Key Parameters
The following parameters can be taken into account as variables for creating optimized timetables:
- Number of classrooms available
- Number of batches of students
- Number of subjects to be taught in a particular semester
- Names of subjects
- Maximum number of classes per day
- Number of classes to be conducted for a subject per week / per day
- Number of faculties available for different subjects
- Average number of leaves a faculty member takes in a month
- Special classes that have fixed slots in timetable
Students may also consider additional variables that may help in effective timetable preparation.

Expected Solution

A web-based platform that can be linked to the college website. Authorized personnel will be able to login and input data against the listed variables to generate fully optimized timetables. The platform should include:

• Login facility for authorized personnel to create and manage timetables

• Multiple options of optimized timetables to choose from

• Review and approval workflow for competent authorities

• Suggestions for suitable rearrangements when optimal solutions are not available

• Support for multi-department and multi-shift scheduling

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SDG 11: SUSTAINABLE CITIES AND COMMUNITIES

Problem ID: NOV-S016
Title: Crowdsourced Civic Issue Reporting and Resolution System
Category: Software Development
Sponsoring Organization: Government of Jharkhand

PROBLEM DESCRIPTION

Urban communities face numerous civic issues such as broken streetlights, potholes, water leakages, garbage collection problems, and infrastructure failures. Current reporting mechanisms are inefficient, leading to delayed responses and citizen dissatisfaction with municipal services.

CHALLENGE STATEMENT

Develop a comprehensive civic engagement platform that:

- Enables citizens to report civic issues through mobile app with photo/video evidence

- Automatically categorizes and prioritizes issues based on severity and location

- Tracks issue resolution progress and provides real-time updates to citizens

- Facilitates communication between citizens and municipal authorities

- Includes analytics for urban planning and resource allocation decisions

EXPECTED DELIVERABLES

- Mobile application for citizen issue reporting with GPS integration

- Web dashboard for municipal authorities and department coordination

- Automated issue categorization and priority assignment system

- Real-time tracking and notification system for issue status updates

- Analytics dashboard for civic planning and performance monitoring

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SDG 4: QUALITY EDUCATION

(STUDENT INNOVATION)

Problem ID: NOV-S017
Title: SRIT IPR CELL Web Portal
Category: Software
Organization: Sri Ramakrishna Institute of Technology

PROBLEM STATEMENT:

Sri Ramakrishna Institute of Technology requires a comprehensive Intellectual Property Rights (IPR) Cell Management System to effectively track, monitor, and manage the intellectual property activities of students and faculty members. At present, there is no streamlined digital solution that integrates patent application tracking, ranking, analytics, and institutional reporting in compliance with regulatory portals like Kapila.

CHALLENGE STATEMENT:

The challenge is to design and implement a secure, user-friendly, and integrated web portal that supports dual-access authentication, patent registration and status tracking, ranking/analytics dashboards, administrative reporting, and seamless integration with the Kapila portal while ensuring data privacy, compliance, and scalability.

EXPECTED DELIVERABLES:

- A web-based IPR Cell Management portal with dual login access (admin & student/faculty).
- Patent registration and status tracking (Applied → Under Examination → Published → Granted).
- Document upload and management for each patent milestone.
- Automated ranking and analytics system with leaderboards for students/faculty.
- Administrative reporting with filtering (time-period, domain, IPR category).
- Export capabilities (Excel, PDF) and audit trails for institutional use.
- Seamless integration with Kapila portal data formats.
- Bulk data import/export functionality with strong security and compliance measures.

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