Revised Detailed Project Report

Technology Innovation Hub under

National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS)

Technology Vertical: Device Technology and Materials

Submitted by

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Dean, Sponsored Research & Industrial Consultancy

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Uttarakhand -247 667 (INDIA)

September 2021

Endorsement from the Head of the Institution

1. Certified that the Institute welcomes participation of Sudeb Dasgupta, Professor, Department of Electronics and Communication Engineering, as the Project Director for the Technology Innovation Hub (TIH) and that in the unforeseen event of discontinuance by the Project Director, the Indian Institute of Technology Roorkee will identify and place a suitable faculty as Project Director for fruitful completion of the TIH activities.

2. Certified that the Host Institute shall provide basic facilities, faculty support and such other administrative facilities as per Terms and Conditions of the award of TIH, will be extended to TIH.

3. As per Tri-partite Agreement, the Host Institute (HI) shall play its role and fulfil its responsibilities for the success of TIH.

Dated : 21.09.2021
Place : IIT Roorkee

Manish

Name and Signature of Head of Institution

Dean
Sponsored Research & Industrial Consultancy
Indian Institute of Technology Roorkee
Roorkee-247 667 (INDIA)

CERTIFICATE

Name of the TIH: DIVYASAMPARK IHUB ROORKEE FOR DEVICES MATERIALS AND TECHNOLOGY FOUNDATION

Technology Vertical: DEVICE MATERIALS AND TECHNOLOGY

1. This is to certify that the Detailed Project Report (DPR) on the Technology Vertical Device Materials and Technology is prepared and submitted to Mission Office, NM-ICPS, DST is as part of implementation of Technology Innovation Hub (TIH) at Indian Institute of Technology Roorkee, Uttarakhand under National Mission on Interdisciplinary Cyber-Physical System (NM-ICPS).

2. This is to certify that this DPR has been checked for plagiarism and the contents are original and not copied/taken from any one or from any other sources. If some content was taken from certain sources, it is duly acknowledged and referenced accordingly.

3. The DPR will be implemented as per the Terms, Reference and Clauses stated in Tripartite Agreement signed on 27th November 2020 between Mission Office, DST, IIT Roorkee and Divyasamaprk iHub Roorkee for Devices Materials and Technology Foundation.

Date: **20th September 2021**

Place: **Roorkee**

Sudeb Dasgupta
Project Director

Divyasampark iHUB Roorkee for Devices Materials and Technology Foundation

प्रो. सुदेब दासगुप्ता / Prof. Sudeb Dasgupta
सेक्रेटरी, बोर्ड ऑफ डायरेक्टर/
Secretary / Board Of Director
टी.आई.एच., रुड़की / TIH Roorkee

VISION

To become a key contributor to 'Digital India' and 'Aatmanirbhar Bharat' by promoting translational research, enhancing core competencies, capacity building, and training in CPS technologies to provide commercially viable solutions.

MISSION

- To foster research & innovation towards product/technology development and commercialization in CPS with relevant and next-generation smart Devices and smart Materials in the areas of Healthcare 4.0, Industry 4.0 and Smart Cities.

- Continuously identify need areas and provide solution by CPS technologies.

- Support and encourage energetic, aspiring, talented, and young minds to become entrepreneurs.

- Provide a world class interactive networked platform for all stakeholders in CPS innovation ecosystem.

CONTENTS

1. EXECUTIVE SUMMARY

'iHUB DivyaSampark, aims to enable innovative ecosystem in cyber- physical systems (CPS) and becoming the source for the next generation of digital technologies, products and services by promoting translational research, enhancing core competencies, capacity building, training to provide solutions for national strategic sectors and becoming a key contributor to Digital India. The hub will foster research innovation towards product/technology development and commercialization in CPS with relevant and next-generation Devices and Materials in the areas of

(a)   Healthcare 4.0

(b)   Industry 4.0

(c)   Smart Cities

The hub envisions that the smart devices and materials are the key enablers for CPS which includes sensors, actuators, computing, communication and control devices built on the smart engineering of the existing and novel materials intelligently coupled with frontier trends like artificial intelligence, machine learning, augmented/virtual reality etc. The ability to interact with cyber world and expand the capabilities of the physical world through smart devices and materials would be the core for future technology developments. The HUB will continuously identify research trends and need areas in the market place and Indian social sector and will liaison with both government and industries to map the needs with the key technologies developed in the HUB and working towards self-reliant India. The hub is thus keen to take **Grand challenges** in strategic and socially relevant sectors by envisioning (a) Affordable and Accessible Healthcare for Every Indian, (b) Making Indian MSME globally competitive and (c) People centered 'Smart Cities'.

This is aimed to be achieved by developing technologies useful for low-resource settings, digital transformation of Indian industries and perpetuating usage of information-communication technology

(ICT) solutions for the day to day city operations. The technologies developed in these domains would be tailored and offered for licensing and commercialization through industry or start-up mode.

The hub would build linkages and collaborations with the network of academic institutes, research labs, individuals, groups across India and abroad and will work in close collaboration with industry to create symbiotic relationships and build an expert network in the devices and materials technologies for CPS. In this respect, hub plans to create several Spokes under **"Hub & Spoke"** model to expand the funnel size of the innovation. Further, the hub would consolidate information about various material centers, nano-fabrication centers, fabrication services, development centers etc and would work closely with the startup ecosystem, corporate, governments and regulatory bodies. The hub will thus act as a nodal center for spearheading the activities in Devices, Materials and Technology. The hub would have information about expertise, technologies, infrastructure tools, start-ups, industries and ministries etc. and would act as a coordinator and mediator for technology/product development, commercialization and dissemination.

Through its supportive innovative ecosystem, the hub would make itself as a platform where it can offer something to each of the stake-holders. For students, it would provide fellowships, opportunity to work on innovative products with faculty/industry/start-ups, Entrepreneurship training programs and opportunity to find future Co-Founders. For researchers, it would provide technology development and entrepreneurship support, networking platforms, industry connections and funds. For Entrepreneurs and Start-Ups, the hub would conduct programs such as Entrepreneur-In-Residence/PRAYAS/Accelerator, opportunity for incubation and seed- support. For Industries, the hub would enable early access to the technologies and joint development, exploratory research at low risk, technology transfer and licensing opportunities.

Skill development would be another major focus area where hub is taking target of training 50,000 students and professionals via various certificate courses. To effectively run this program and for better marketing purpose, hub will coordinate with EdTech startup companies so that in a long run this activity

can become self-sustainable.

Further, the hub will work and focus on following activities for generating revenues so that financial self-sustainability can be achieved.

a)   IP Licensing fee and revenue sharing of technologies commercialized

b)   Holding stake in start-ups

c)   Paid workshops, training and skill development,

d)   Consulting projects

e)   Equipment usage or certification fee (ref. test beds, common use equipment's etc.)

2. CONTEXT AND BACKGROUND

Technology has made its presence felt in various sectors of India's development in the last twenty years. While we have a strong research base, some gaps remain in the availability of skilled manpower and indigenously developed technologies that can help the country deliver on their promise. It is because of these gaps the research is not being efficiently translated into product outcomes.

Translational research seeks to produce more meaningful, applicable results that directly benefit our overall growth. The goal of translational research is to translate basic science discoveries more quickly and efficiently into practice. The term "Cyber Physical system" was initially coined by Ellen Gill in 2006. CPS is a category of embedded system. It is often called a Next Generation Computing System which uses smart computation techniques associated with physical world and computational units. The CPS can interact with the real-world systems by means of Computation, Communication and controls. The interaction of computational and physical units leads to advanced implementations of Internet of Things (IoT). IoT and CPS are designed to support real time applications which can manage many environmental datasets. In other words, CPS is a combination of digital controls and the physical environment.

Cyber-Physical Systems (CPS) combines digital/ cyber elements with physical objects (e.g. machines, autonomous vehicles) and data with capabilities of communication, data collection & processing, computing, decision making and action. Cyber-Physical Systems allow organizations to take timely and optimal interventions/ actions. CPS is an integrated system involving Sensors, Communication, Actuators, Control, interconnected computing networks and data analytics.

The proposed Hub aims to converge all stakeholders by establishing strong linkages between academia, industry, Government and International Organizations. Around 55 faculties from IIT Roorkee, having a strong research base in Device Materials and Technology have shown interest at initial stage of TIH IIT Roorkee. Apart from IIT Roorkee, faculty from IIT Guwahati, BITS Pilani etc. have also shown their interest in the product development and its commercialization.

3. PROBLEMS TO BE ADDRESSED

GRAND CHALLENGE

TIH shall at time to time release a call/organize a grand challenge to solve the problems received from the state government, PSUs and other ministries in the areas of

1. Healthcare 4.0
2. Industry 4.0
3. Smart city

The problem statements received and taken up as grand challenge will be such that the solution of which will be beneficial to a large section of society.

We have already taken the first step by signing an MoU with Energy Efficiency Services Limited (EESL) to solve the problem statements received from them for better and efficient use of energy and using Artificial Intelligence to control it efficiently.

We are also in final stages of signing an MoU with Uttarakhand govt. to receive problem statements from them and trying to solve it. We already received a problem statement to develop an Intelligent Traffic Light System from Uttarakhand and Bihar govt. Similar efforts will be made with other state governments. We released a call to solve this problem and have initiated the prototype development for this grand challenge received.

Besides this we shall be actively taking the problem statements (related to line ministries) received by the mission office from time to time and take it up as grand challenges.

TIH at IIT Roorkee aims at innovation in Device Materials and Technology. It will nurture technology growth to fill the gap between research and its deliverance to all the end users. TIH IIT Roorkee will focus on the following grand challenges:

3.1   Healthcare 4.0: Technologies for Healthcare in low resource settings

3.1.1   Affordable and Accessible Healthcare for Every Indian

In India, there is huge limitations in healthcare services due to limited number of hospitals, shortage of qualified healthcare professionals and services like qualified doctors, nurses, technicians and debilitating medical infrastructure. Adding to the problem is non-uniform and restricted accessibility to healthcare across

the country and huge disparity between rural, semi-urban and urban India as most of the basic and advanced healthcare facilities are concentrated in and around tier 1 and tier 2 cities [NDHM, DR, IBEF, AI1]. Further, there is lack of consistency in healthcare quality as most of the services are driven by individuals or individual entities rather than institution/organization with less than 2% of hospitals in India having accreditation. This makes healthcare services very expensive in which poor and marginalized are hit the most and sizeable part of the population are faced with poverty every year because of their healthcare expenditure. Additionally, due to lack of awareness and healthcare costs, the majority of patients approach the medical hospital or practitioner only when a disease has advanced, thus increasing the cost of care and reducing the chances of recovery [NDHM, DR, IBEF, AI1].

Thus, there is an urgent and persistent need to improve the healthcare landscape in India by addressing the need to prevent, diagnose, monitor, and treat several communicable, noncommunicable and chronic diseases in a way that healthcare is accessible and affordable by every Indian. The Government of India has attempted series of large scale interventions to address the above mentioned challenges through transformation of health and wellness centers, developing district hospitals to cater to long-term care for non- communicable diseases, Ayushman Bharat Mission, promoting e-Health etc. However,

it is considerably recognized that the adoption of advanced devices and technologies such as Internet of medical things (IoMT), robotics, telemedicine, augmented (AR) and virtual reality (VR), wearable systems, mobile health apps, Artificial intelligence (AI), data analysis etc, would bring the much-needed changes in the Indian healthcare system in a much efficient way by reducing costs and providing easy accessibility.

3.1.2 Technology Solutions for Indian healthcare landscape

Indian medical devices and technologies market stood at Rs. 77,539 crores (US$ 11 billion) in 2020. The market is expected to increase at a CAGR of 35.4% from 2020 to 2025, reaching Rs. 352,450 crores (US$ 50 billion) [IBEF]. The current medical device industry in India is driven by imports from USA, China and Germany. The government is planning to create/develop a manufacturing base for medical devices and technologies to support its population, enhance health infrastructure and promote exports as it considers this sector as sunrise sector. It is anticipated that Indian healthcare is ripe for disruption from emerging technologies at multiple levels. The increased advances in technologies, interest and activity from innovators,

government initiatives to create innovative ecosystems (like technology innovation hubs under NMICPS) provides timely opportunity for India to solve its long existing challenges in providing appropriate healthcare to its population.

From customers' perspective, it would not only be individual patients, but also doctors, polyclinics/hospitals, pharmaceutical companies (by knowing people health status they can evaluate market potential of their drugs, research for new drugs or clinical trials; or in the drug supply chain for monitoring the storage conditions), health insurance companies and Government (by monitoring people health, maintaining health records and planning health policies).

However, the success of the ongoing and emerging efforts to improve Indian healthcare landscape would very much depend on the ability and efforts of medical technology developers to innovate new and affordable products and deliver them to the marketplace. The right solutions will also be able to maximize the usage of existing resources/infrastructure and significantly impact the way healthcare services are provided. A number of emerging technologies, as mentioned below, hold great potential to address the needs of Indian healthcare services, which IHUB Divyasampark would be undertaking to augment and accelerate Government initiatives.

3.1.3 Internet of Medical Things (IOMT) and Telemedicine devices

The IoMT (Internet of Medical Things) is interconnecting people (patients, medical practitioners etc), data and processes through connected medical devices on an information technology (IT) platform to help improve patient outcomes. Many healthcare organizations are seeking out IoMT solutions to stay connected and communicate patient data. IoT devices that are interconnected will improve patient monitoring, patient outcomes, and decrease errors. IoMT enabled hospital equipment can be tracked and managed easily without any hassle. IoMT technology would also help in pharmaceutical shipments that measure temperature, shock, humidity, tilt etc and provide end-to-end visibility solutions of the storage and transport conditions in its supply chain and hence having updated information about the efficacy of the pharmaceuticals. Telemedicine is about having the process of having remote diagnosis, consulting and medication. Since health is a state subject, states are supported under National Health Mission (NHM) for services like Telemedicine, Tele-Radiology, Tele-Oncology, Tele-Ophthalmology etc and Hospital Information System (HIS) [NDHM

Blueprint].

IoMT and telemedicine platform technologies together with wearable medical systems thus would be very effective in remote consultations or in-home monitoring which would be much faster, cheaper and more efficient than traditional healthcare appointments and would also serve the needs for rural/remote hospitals that are in dire need of medical practitioners. The technology is a convenient way to provide medical care even in the situation that requires no physical touch and therefore can prevent the transmission of infectious diseases, reducing the risks to both healthcare workers and patients. These technologies are thus regarded as one of the major innovations in healthcare services, not only from the technological perspective but also from the cultural and social perspectives since it benefits accessibility to health care services and improves the quality of medical care and organizational efficiency.

Through IHUB- Divyasampark, we plan to develop highly modular and customizable solutions that support multiple simultaneous consultations, asset tracking, monitoring supply chain, data storage on server & cloud, data security, rights and privileges based upon user role, integration of legacy medical equipment in an IoMT framework etc.

3.1.4 Artificial Intelligence (AI) and Machine Learning (ML) powered devices

Artificial Intelligence (AI) and Machine Learning (ML) technologies have the potential to transform healthcare sector by addressing issues of high barriers to accessible and affordable healthcare facilities by providing better and earlier diagnosis devoid of human errors, personalized treatment, reducing the cost associated with complications, prevention of illnesses, discovery of new treatments/drugs and early identification of potential pandemics etc. Additionally, the application of AI/ML to healthcare settings would be to set health workers free from hours of mundane data work and leaving the task of examining and analysing the data to the technology that will allow them to focus more on patient care and better outcomes [AI1, AI2, AI3].

Since AI/ML will derive new and important insights from the vast amount of data generated during the healthcare delivery every day, medical device manufacturers have started integrating AI and ML to innovate their products and are experiencing improved patient care. Further, as AI and ML learns and improves from the real-world use and experience, it is predicted that AI and ML based softwares can be considered as a

medical device. AI can be used in a diverse set of therapy areas, including wellness and lifestyle management, diagnostics, wearables and virtual assistants, disease surveillance to predict, model and slow the spread of disease in epidemic situations, etc [AI1, AI2, AI3].

There are several use cases for AI/ML such as building decision-support systems for diagnostics and predictions, computer vision to read medical scans(such as X-rays, CT scans, PET scans and ultrasound scans), early detection of tumours in a non-invasive, non-touch and non-radiation approaches to detect cancer, digital pathology, tele- radiology, hospital bed management and planning, processing of insurance claims, automating the first-level screening of symptoms, finding doctors and booking appointments, chatbots to interact with the patients, derive molecular insights for drug discovery, surgery simulators etc [AI1, AI2, AI3].

3.1.5 Augmented (AR) and Virtual Reality (VR) enabled devices

The benefits of AR and VR include increased learning efficiency for healthcare professionals and increased empathy by enabling someone to see the impact of a disease or condition.

An analysis suggests AR-VR market to reach USD 4,997.9 Million by 2023, at a CAGR of 36.6% during the forecast period of 2017-2025 [M&M]. In the last few years, AR and VR solutions have proven their value and are increasingly established in healthcare training and education, pre-operation and treatment planning, and data/3D model visualization applications. AR and VR solutions are considered reliable and cost-effective digital tools and the introduction of AR elements in telehealth services can add value and clarity for users and fill in gaps exposed today with the difficulty of in-person visits. [ARVR4

3.1.6 Mobile Health Solutions

Mobile health is revolutionizing healthcare, providing patients with access to critical services, personal data tracking and doctors, regardless of their location. As the number of health applications for smartphones, wearables, tablets and other digital technologies

grows, more people will use them to take control of their own healthcare [MH1]. WHO's Global Observatory for eHealth defines it as "medical and public health practice supported by mobile devices, such as [cell] phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices." Mobile health devices and apps can be used to track a range of data from fitness levels and heart rates to medication

dosages and sleep cycles.

Mobile health is important because it helps patients take control of monitoring their own health, which is crucial because of shortage of healthcare workers, serving to rural communities, elderly people and people having difficulty traveling to doctors' offices or paying for their treatments. Few NGOs have begun helping populations use mobile health solutions such as texting and smartphone cameras to receive diagnoses and lifesaving healthcare education [MH1].

3.1.7 Drone based medicinal- material delivery devices

There is a huge demand for cost effective and secure transportation of medicinal materials, like pharmaceuticals, clinical samples for testing and pathology, blood for transfusion, organs for transplant etc. As the production facilities of the medicinal materials are mostly staggered at several places, the logistical requirements and transportation of these materials is an ever-growing challenge. Further, as the efficacy and stability of a biological sample is sensitive to its storage conditions that may deteriorate with time in transit, thus, geographically-challenging locations requiring long routes and urban areas suffering due to excessive congestion in traffic, makes the transportation of blood units, organs and other clinical samples difficult within their required arrival times. Unmanned aerial vehicles (UAV) or drones are a potential option to circumvent this barrier. [UAV]

3.1.8 Certification and Standardization

Since digital devices at present are a completely heterogeneous system both in terms of applications and technologies, there are several challenges which need to be addressed before these can be seamlessly deployed for healthcare ecosystem. The lack of standardization of processes is hampering the industry from exploiting the benefits of IoMT adoption. This is mostly appearing as there are large variations in the equipment's used, their output data format, treatment process which differ widely by hospitals, doctors, clinics etc. The healthcare industry is knowledgeable of this fact but not really know how this standardization can be achieved and implemented. The issues that needs to be considered: (a) Biomaterials grades and safety, including carcinogenicity and toxicity of the IoMT devices which interact with the body, (b) assessment of

true and false signaling, signal modification in transmission / transfer, ensure reliability while transmitting critical life events, (c) Repeatability - adjustments of the working environments to produce uniform results in different working environment (such as temperature extremes, low battery etc.) and (d) Interoperability w.r.t received sensor data format from the various medical devices obeying different medical device standards, even of the same category [GICT].

3.1.9 Technology for broad-based health surveillance

The IoMT devices networks along with AI/ML and AR/VR are capable to help the government in healthcare surveillance, which is a necessity to ensure the existence of a healthy population. At present, most of the surveillance (the constant monitoring and collection of data of children, students, elderly people and patients from health camps, hospitals, elderly homes, military camps etc.) is done manually, which is time consuming process with several drawbacks. With more sensor networks being connected via IoT, monitoring and surveillance would be quick, error free and helps government in making nation specific health care report and health policies. The role of these technologies in preventing the spread of infectious diseases is very well recognized and can be presented as a very relevant case in the current case of COVID-19 pandemic. For example, monitoring of the patient's temperature and vital signs can be used to detect and monitor the infected patients. The data collected is very useful to prevent the spreading of the infection at the early stage of the outbreak and to predict the spread of the outbreak [HS].

3.2 Smart Cities

In the last several years there has been explosive growth of information and communication technologies (ICTs) due to advancement of hardware and software designs. The use of ICT in cities in various forms for different city activities will lead to the increased effectiveness of city operations. The smart city is a concept and there is still not a clear and consistent definition of the concept among academia and practitioners. Moreover, these advancement in researches for making achieving these smart cities, do not have a wide practical application. In a simple way, we may say that a smart city is a place where traditional networks and services are made more flexible, efficient, and sustainable with the use of information, digital and telecommunication technologies, to improve its operations for the benefit of its inhabitants. In other words,

in a smart city, the digital technologies translate into better public services for inhabitants, and for better use of resources while impacting the environment less. TIH IIT Roorkee will focus on these technologies for achieving smart cities nationwide.

World population has increased significantly in the last decades and so has the expectation of living standards. This results in more population moving towards the urban areas for settlement, causing wide consumption of energy. This increase in consumption of world's resources causes generation of greenhouse gases. Thus, in the next few decades there can be severe negative impact on the environment. This makes the concept of smart cities a necessity. The creation of smart cities is a natural strategy to mitigate the problems emerging by rapid urbanization and urban population growth. Smart cities, in spite of the costs associated, once implemented can reduce energy consumption, water consumption, carbon emissions, transportation requirements, and city waste.

We at iHUB DivyaSampark @ IIT Roorkee will aim at making smart cities sustainable, with better quality of life (QoL), urbanization, and smartness. The sustainability of a smart city is related to city infrastructure and governance, energy and climate change, pollution and waste, and social issues, economics and health. The quality of life (QoL) can be measured in terms of the emotional and financial well-being of the citizens. The urbanization aspects of the smart city include multiple aspects and indicators, such as technology, infrastructure, governance, and economics. The smartness of a smart city is conceptualized as the ambition to improve economic, social and environmental standards of the city and its inhabitants. Various commonly quoted aspects of city smartness include smart economy, smart people, smart governance, smart mobility, and smart living. The focus will be on: -

3.2.1 Smart Infrastructure and Building

In the context of smart cities, anything physical, electrical, and digital that is the backbone of the smart city can be considered as its infrastructure. There are many examples, and a few are: rapid transit system, waste management system, road network, railway network, communication system, traffic light system, street light system, office space, water supply system, gas supply system, power supply system, firefighting system, hospital system, bridges, apartment homes, hotels, digital library, law enforcement, economy system, etc.

The Information and communication Technology (ICT) infrastructure are fundamental to the construction of smart cities and depends on factors related to its availability and performance. The ICT infrastructure includes communication infrastructure such as fiber optics, Wi-Fi networks, wireless hotspots as well as service-oriented information systems. Smart infrastructure is more efficient, safe, secure, and fault-tolerant as compared to classic infrastructure.

3.2.2   Smart Transportation

Traditional transportation systems or facilities such as the railway network, road transport, airline transport, and water transport have existed for a long time. In traditional transport each of these operates independently even in a specific type of transport system, making global usage difficult. Smart transportation also known as the Intelligent Transport Systems (ITS) includes various types of 6 communication and navigation systems in vehicles, between vehicles (e.g. car-to-car), and between vehicles and fixed locations (e.g. car-to-infrastructure). ITS also covers the rail, water, and air transport systems, and even their interactions. The smart transportation system maximizes the utilization of the vehicles used in the system, for example, the number of aircraft that an airline has or the number of trains a railway network has. The smart transportation system allows passengers to easily select different transportation options for low-cost, shortest distance, or fastest routes.

3.2.3   Smart Energy Grids

In the last several years, in addition to traditional energy forms, many other terms are associated with it including clean energy, green energy, sustainable energy, renewable energy, and smart energy. The fear that energy sources available for human consumption will be depleted has been driving these new energy related terms. Clean energy or green energy suggests that the energy consumption has very minimal negative impact on the environment. The backbone of a smart energy system is the smart energy grid or smart grid. The use of ICT plays a key role in a smart grid for the following: (1) to support demand-response management of energy usage, (2) to dispatch power generation for solar panels and wind turbines, (3) to facilitate location-independent, point-of-sale transactional services for PEVs, and (4) enhancing consumer relationships.

3.3 Industry 4.0: Digital Transformation of Indian Industries

3.3.1 Making Indian MSME globally competitive

Micro, Small and Medium Enterprises (MSMEs) are key pillar of Indian economy and is contributing to 6.11 percent of the manufacturing GDP, 24.63 percent of the services, 33.4 percent of India's manufacturing output and 34 percent of the total exports across diverse range of commodities, and employing about 110 million workers [MSME1, CII]. Not only MSMEs leads to entrepreneurial development and the diversification of the industrial sector, but also is considered a strategic sector for addressing Indian challenges of alleviating poverty, reducing disparity and creating wealth. In the last decade, Indian MSMEs have moved up the value chain from manufacturing of simple goods to sophisticated products and had also entered the services sector. However, Indian MSME sectors still face lots of challenges like sub- optimal ways of operation, supply chain inefficiencies, technological in competencies, low productivity, etc. To sustain themselves with such issues and remain competitive against large and global enterprises, it is inevitable that MSMEs need to adopt innovative approaches in their working. These innovations could happen at multiple levels, like in business processes, product/ service development, advanced technology, skilling the workforce etc to compete with large enterprises globally [CII, SD]. Industry 4.0 solutions are emerging as a response to all these challenges. Industry 4.0 is about holistic automation with highly intelligent connected systems creating a fully digital value chain, manufacturing execution architecture, enterprise information to improve MSME industry outputs by integrating all aspects of production and commerce with greater efficiency. The GoI has made several efforts in this direction at policy level and had set up incentives for infrastructure development on a PPP (Public Private Partnership) model. Samarth Udyog Bharat 4.0 (Smart Advanced Manufacturing and Rapid Transformation Hubs: SUB 4.0) under the Ministry of Heavy Industries & Public Enterprises is the India's initiative to push for Industry 4.0 implementation to propagate adoption of digital technology solutions by Indian industries [SD]. Other GoI programs like 'Make in India', 'Skill India' and 'Aatmanirbhar Bharat' are complementing SUB 4.0. capabilities in the last few decades. **iHUB DivyaSampark at IIT Roorkee** will leverage upon Industry 4.0 solutions in association with latest technologies like AI, IoT, Cloud computing, AR, 3D printing etc. to enhance global competitiveness of MSMEs and would contribute in influencing sectors like manufacturing, supply chain management, construction, mining, shipping etc. and shall impact all the

aspects of our day-to-day activities.

3.3.2 Technology Solutions for Indian Industries

- **Predictive Technologies:** The sudden failures and unplanned equipment downtime are significant adversaries for industries causing huge loss to them. Predictive maintenance (PdM), also sometimes called Condition based maintenance (CbM), is maintenance method that monitors the performance and condition of equipment during normal operation to reduce the likelihood of failures. The goal of the predictive maintenance is the ability to initially predict about the equipment failure by accounting into certain factors, which is then followed by preventing the failure through regularly scheduled and corrective maintenance. Predictive maintenance and condition monitoring go hand in hand to allow continuous monitoring of machines during its operation to ensure the optimal use of machines. As per reports, predictive maintenance solutions can help the industries by (a) increasing machine availability and uptime by 10–20%, (b) subdue maintenance planning time by 20-50%, and (c) reduce the overall maintenance costs by 5–10%. [Delliotte1, Delloitte2]. The predictive technologies are mainly implemented by several condition- monitoring devices and techniques for effectively predicting failure and providing advanced warning for maintenance. Few examples are based on vibration analysis, infrared thermography, acoustic analysis, oil analysis, eddy current analysis etc. However, the new generation of predictive maintenance solutions are powered by state-of-the-art Industrial IoT/sensor solutions and are combined with state-of-the-art AI/machine learning algorithms. The continuous flow of data from the connected machines and related systems enables real time monitoring and thus mitigating potential damage. The interconnected machineries, assets and people in a data driven and analytical framework enable more accurate predictive analysis, enabling organizations to holistically make decisions, intelligently suggests about approaches to maintaining assets, allow for end-to-end transparency, optimize the performance and use of machinery [Delliotte].

- **Industrial IoT (IIoT):** Industrial IoT is about interconnected machineries, physical assets and people. IIoT deployments are growing at a significant speed as 'connectivity adds more clarity, speed and efficiency to the industrial process, quality or manufacturing engineers. According to a McKinsey

survey, industries are actively exploring the industrial IoT use cases such as

(a) Service level optimization,

(b) Enhanced operational visibility,

(c) New service offerings,

(d) Connected products,

(e) Manufacturing process optimization,

(f) quality control,

(g) avoid hazardous scenarios and

(h) Improved sales [Delloitte2].

One of the main IIoT applications is related to the automated management of equipment, allowing a centralized system to control and monitor all company processes. This ability to remotely control equipment via digital machines and software also implies that it is possible to control several plants located at different geographic locations. This gives companies an unprecedented ability to oversee advances in their production in real time, while also being able to analyze historical data that they obtain in relation to their processes. The objective of collecting and using that data is to support the improvement of processes and generating an environment where information-based decisions are a priority [Nexus].

- **Digital Twining:** Digital twinning is the important component of truly smart factories. Technically, a twin is a cloud-based representation of a product, asset or one of its components that can be leveraged to run highly accurate simulations. Powered by real-time data, predictive analytics and ML algorithms, digital twins are handy and cost-effective assets for conducting various pilots, pressure-test the performance of the systems, validate certain engineering assumptions, without actually building the costly physical prototypes. Additionally, digital twins can be created for any equipment or machine that could: -

  (a) virtually test, optimize and fine- tune the performance of every asset before applying any changes

on the ground,

(b) Identify production bottlenecks and potential failures before any operation begins and

(c) Continuously collect new data for further process optimization.

- **Supply Chain sustainability:** A MIT report suggests that supply chain sustainability affects industries companies on both tactical and strategic levels. The digital transformation of supply chains is only accelerating. From trends like data platforms, the internet of things, artificial intelligence, and machine learning, companies are applying technologies to create more efficient and cost-effective supply chains with more visibility, driving down inventory and increasing speed to the customer. Additionally, drones, additive manufacturing, and blockchain (can be integrated into supply chains to increase productivity, adjust processes, and reduce operational costs. [SCS]

- **Sensors:** Smart sensors are the drivers of Industry 4.0 and the Internet of things (IoT) in factories and workplaces. If the smart sensors are implemented in large scale, where they are coupled with increased computational power, it will enable new ways to analyze data and gain actionable insights to improve several operations areas, agile production processes that ensure and enhance performance across a range of industrial sectors. The smart sensors typically are a combination of a sensor, microprocessor, and communication technology that used to convert environmental inputs (eg pressure, temperature, humidity, vibration, weight, etc) into readable data and transmit it wirelessly onwards to a centralized control server/repository. In contrast, conventional sensors rely on the manufacturer to perform the processing of inputs. Smart sensors thus allow for data to be transmitted with less errors, as the processing happens closer to the source, and can remain within the industry/organization network. Moreover, smart sensors can be more easily customized for specific use cases while traditional sensors are generally mass produced.

4. AIMS AND OBJECTIVES

Technology Innovation Hub at IIT Roorkee aims at increasing research base, generating knowledge through

basic and applied science and its translation into product development and commercialization. TIH at IIT Roorkee will focus on efficient and affordable technologies which will contribute to the overall growth and development of India. It will aim at providing facilities to nurture new ideas and help develop inquisitive perspective. The hub will serve as springboards for new ideas and innovation and thus helping the society and economy to face future challenges and meet rising aspirations of the growing population.

The hub will be expert-driven, focusing on the research for specific requirements of Industry, other government verticals and International Collaborative Research Programs. Technology development by delivering technologies or technology solutions on the ground is focused.

Apart from this the Hub will develop highly knowledgeable human resource with top-order skills including Graduate Internships, Postgraduate Fellowships, Doctoral Fellowships, Post-doctoral Fellowships, Faculty Fellowships, Chair Professorships. Further, Hub would achieve a leadership position in India by launching several skill development programs. These programs would be designed and run in such a way that it becomes self-sustainable over a longer period.

The Hub development mechanism adopts a bottom-up revenue model in which the Hub's initiation is by government support, through NM-ICPS, for developing capabilities and gradual build-up of resource generation in the later years of the Section 8 company. The hub objectifies enhancing competencies, capacity building and training to nurture innovation and start-ups. It will also support young and aspiring entrepreneurs for enabling translation of idea to prototype. It will inspire best talents to be entrepreneurs by providing support in the form of fellowship, providing guidance and coworking spaces for developing their ideas into products. Besides this TIH at IIT Roorkee will create not only create its own CPS specialized incubator and accelerator but also establish linkages with existing Technology Business Incubators (TBI) at IIT Roorkee as well as other TBIs and innovation hubs all over India.

As per the NMICPS mandate, iHUB DivyaSampark will also work of '**Hub and spoke'** model to increase the funnel size of the innovation. Hub would target to create minimum 15 such spokes and target would be creating such spokes in tier 2 and tier 3 cities.

The hub will collaborate with various national and international collaborators which will connect the Indian research with the global efforts in proposed domain area. Considering its focus on Device, material and

technologies efforts would be made establish special linkages with countries like USA, Taiwan and South Korea that are world leader in device technology related innovation.

5. TARGET DELIVERABLES

The TIH shall develop industry-ready products with unique selling points based on translational research and development.

S No	Target Area	Targets					
		1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	Total
1	**Technology Development**						
(a)	No of Technologies (IP, Licensing, Patents etc)	-	-	5	10	10	25
(b)	Technology Products	-	-	5	10	10	25
(c)	Publications, IPR and Other Intellectual activities	-	-	15	30	30	75
(d)	Increase in CPS Research Base	-	-	5	30	50	85
2	**Entrepreneurship Development**						
(a)	Technology Business Incubator (TBI)	-	-	1	-	-	1
(b)	Start-ups & Spin-off companies	-	-	3	20	20	43
(c)	GCC -Grand Challenges & Competitions	-	-	1	-	-	1
(d)	Promotion and Acceleration of Young and Aspiring technology entrepreneurs (PRAYAS)	-	-	1	-	-	1
(e)	CPS-Entrepreneur In Residence (EIR)	-	-	5	10	10	25
(f)	Dedicated Innovation Accelerator (DIAL)	-	-	1	-	-	1
(g)	CPS-Seed Support System (CPS-SSS)	-	-	1	-	-	1
(h)	Job Creation	0	125	2500	4000	4000	10625
3	**Human Resource Development**						
(a)	Graduate Fellowships	10	40	100	80	40	270
(b)	Post Graduate Fellowships	-	-	10	15	25	50
(c)	Doctoral Fellowships	-	-	10	10	4	24
(d)	Faculty Fellowships	-	3	3	-	-	6
(e)	Chair Professors	-	3	3	-	-	6
(f)	Skill Development	-	-	60	200	250	510
4	**International Collaboration**	-	-	1	-	-	1

6. STRATEGY

6.1 for Human Development Challenges

IT Roorkee, being a well-established institute with state-of-the-art technologies, have a strong and diverse background of talented and skilled manpower comprising senior year undergraduate students, research scholars and various graduates from other academic institutions. Every department has faculty and students involved extensively in research activities. Undergraduate education is greatly benefited by the environment of postgraduate programs, while both the curricula derives strength in a research environment created by doctoral and postdoctoral programs.

Not only the departments of the Institute, the various academic centers are also involved in research activities, in order to contribute and benefit from the advances in knowledge frontiers, which will help generate state-of-the-art technologies responding to the need of the country.

Divyasampark will start several training programs (on-campus and online) in collaboration with its partners or via in-house expertise. These programs will focus on skill development and hands on training. The material for these training programs will be posted online. The online programs are likely to engage many experts from the industry, who are unable to devote full time in the on-campus workshops. In addition, the participation of graduate, post-graduate, doctoral, post-doctoral and faculty at IIT Roorkee is also expected in various researches at Divyasampark.

The hub will target not only tier I & II colleges for the same, but also focusses on connecting with the tier 3 & 4 colleges. We believe that innovation should not be limited to IITs and NITs and want to take it to grassroot level also. As discussed before, several Spokes would be created so that we can reach out to many remote areas for various Skill development activities.

The hub shall also be launching some flagship programs which will not only be for graduates and faculty members across the country, but also for anyone who has an idea and wants to pursue it towards development and commercialization of the product. The hub shall encourage grassroot innovations without any limitations to minimum education criteria for the innovators. This will help us to increase the funnel size and reach out to a larger no. of masses.

Open Calls in focus domain areas, involving VC funds and incubators in the selection process to ensure that next round of funding will be achieved easily. Also, the hub has curated special online training programs in innovation and entrepreneurship. Besides this we have also launched a flexible EIR program which allows the innovator to incubate at any location.

PLAN OF ACTION FOR ACHIEVING TARGETS

6.2 Strategy for Technical Challenges

Through its research outreach unit, the HUB will continuously identify research trends and need areas in market place and Indian social sector. The research marketing cell will liaison with both government departments and industry to work on identifying market and social sector needs and map them with the key technology developed by the HUB.

The product development and technology commercialization teams will work on developing products by tailoring technologies developed and offer them for licensing and commercialization through industry or start-up mode.

6.3 Revenue Generation

The HUB will work on following activities for generating revenues:

- IP Licensing fee and revenue sharing of technologies commercialized

- Holding stake in start-ups

- Paid workshops, training and skill development

- Consulting projects

- Equipment usage fee/test bed usage fee

The major technical challenges are identifying the key problems and issues that are common for each of the products are, understand the specific issues regarding the products address and connecting them with best possible partners from the industry for commercialization. Divyasampark will be responsible for delivering commercial technology and taking ideas, concepts or prototypes and turning them into marketable products. The strategy to address the challenges is to identify and understand the problems resolved by development of infrastructure tools for direct application of basic and applied research leading to technology development, including development of new areas of CPS applications, the target beneficiaries and the unique selling point of the device or product that shall make it remunerative from a commercial perspective.

Divyasampark will connect to a global network of leading labs, institutes and researchers that can enable close research collaborations. Eventually, projection is made based on the deliverables and the benefits in terms of revenue generation estimated based on IP creation or creation of a start-up. Divyasampark will take responsibility for the entire life cycle of IP generated by Divyasampark funding covering the filing for protection via patents, copyrights or trademarks and finding suitable licenses. Divyasampark shall leverage the expertise and equipment/resources available at IIT Roorkee to address any technical issues. Ongoing efforts to establish cooperation with academic and research institutions across the country shall augment the efforts undertaken at IIT Roorkee with respect to the CPS (Cyber Physical System) under NM-ICPS.

6.4 Development of an Interactive website

Besides this the hub is also planning to have a robust, innovation website which will act as a common database for all the CPS related database, researches, researchers, etc. The website will be a two-way interactive website. This will help in connecting people already working in the domain of cyber physical systems. Also, it will be a boon for people who align with the vision and mission of the hub and are willing to associate with Divyasampark.

7. TARGET BENEFICIARIES

Through the hub, we aim at benefiting a decent range of end users. The development and growth in the medical field will be beneficial to individual doctors, clinics, local medical hospitals, etc. The hub shall focus on affordable, easy to use and more precise medical devices which in turn will benefit every individual. Divyasampark will focus on technology driven medical devices which will support the large population needs as well. IOMT will be an effective in monitoring in house as well as remotely. This technology will prove to be a boon in medical care as no physical touch is required and this will prevent transmission of infectious diseases, reducing risks to both healthcare workers as well as the patients involved.

The development in the area of smart technology will help us conserve energy. Along with this, it will also help in minimizing the cost associated with use of energy. This can be done by automating home usage. It will also help us protect environment. Besides this smart technology offers convenience at various levels and an unprecedented level of security. The development in smart cities can be used by city administration, municipal corporations, society, individuals, etc.

The increasing use of the Industrial Internet of Things is referred to as Industry 4.0. It has a wide range of applications which include machines that can predict failures and trigger maintenance processes autonomously or self-organized coordination that react to unexpected changes in production. This in turn will inspire Innovation 4.0, a move toward digitization for academia and research and development.

8. LEGAL FRAMEWORK

The project will be governed by the legal framework opted by TIH and HI i.e. I.I.T Roorkee. The revenue sharing and joint IP activities with Industry will be set in accordance with this legal framework. At the project level, consent letter has been obtained from different collaborators. However, once the project is sanctioned, the role of different collaborators will be assessed according to the legal framework opted by the TIH with

I.I.T Roorkee. The necessary actions (e.g. MOU) will be taken to ensure compliance to the legal framework of TIH and HI. Similarly, any additional funding from outside such as industry CSR grants from the Industry, sponsored research from the naval, air force, and army technical/research boards, can be obtained as per the legal framework of TIH and HI. All academic and industrial partners participating in this project will be bound by MoUs and agreements for work. The IPRs generated out of this work will be filed jointly and the royalties or other economic gains will be shared based on quantum of work done by individual party and the conditions laid in the MoU. All legal issues arising due to any discontent or dispute will be resolved as per law of land in the jurisdiction of Roorkee region.

9. ENVIRONMENTAL IMPACT

IIT Roorkee has 358.5 acres of land of which 30,000 sq.ft. is earmarked for the iHUB DivyaSampark (TIH) Roorkee. IIT Roorkee proposes the TIH set up in this existing land and does not require any environmental clearances concerning the land acquisition. Since all work in this proposal requires academic, research, and product development, with the help of the existing setup, we could establish TIH including the construction of other allied startups with minimal environmental impact.

During the implementation of the project, the preservation of natural resources and the defense of the environment by introducing the environmental variable into decision-making on projects which are predicted to have a significant impact on the environment will be taken care of.

Environmental clearances are not involved as work be carried out in existing academic and research institutions and it is based on green technologies. Furthermore, forestry clearances are not required as there is no clearance of forest land or acquisitions are involved. Additionally, wildlife clearances are also not required as the project is being implemented at existing academic institutions and there is no direct or indirect impact on wildlife. Hence, the project does not involve any R&D with adverse effects on the environment.

10. TECHNOLOGY

The hub focusses broadly on the following technologies in Device Materials domain, namely:

1. Internet of Medical Things (IOMT) and Telemedicine Devices

2. Artificial Intelligence

3. Machine Learning Powered Devices

4. Augmented and Virtual Reality Devices

5. Industrial IOT

6. Smart Grids

7. Metacomposites

8. Radio Frequency (RF)

9. Cyber Security of devices

10.01. Internet of Medical Things (IoMT): The introduction of IoT into medicine helps in stronger, healthier and easier patient care. From the implantation of medical devices to smart sensors, the IoT will speed up healthcare delivery, enabling doctors to spend less time on transportation, diagnose illnesses and communicate with patients. IoT is is a system of interrelated devices that are connected to a network and/or to each other, exchanging data without necessarily requiring human-to-machine interaction. In other words, IoT is a collection of electronic devices that can share information among themselves. IoMT will be beneficial in remote consultations or when in house monitoring is required. The growth of this technology will also prove to be a boon in treatment of communicating, infectious diseases such as COVID-19. We plan on developing solutions which can be customized and modulated to support multiple simultaneous consultations, asset tracking, monitoring supply chain, data storage on

server & cloud, data security, rights and privileges based upon user role, integration of legacy medical equipment in an IoMT framework etc. Also, we can see that growing IoMT technology is resulting to rise in cyber security risks. Through Divyasampark, we aim at focusing on growth of IoMT and telemedicine's, minimalizing the risks involved.

10.2. Artificial Intelligence: Artificial intelligence (AI) stimulates human intelligence into machines aiming to program those machines to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving. With growing AI technology, some of the most significant and disruptive innovations can be achieved like Self-driving cars, robotic assistants, and automated disease diagnosis etc. All this technology driven products of an emerging AI revolution will help reshaping how we live and work. As technology advances, previous benchmarks that defined artificial intelligence become outdated. For example, machines that calculate basic functions or recognize text through optical character recognition are no longer considered to embody artificial intelligence, since this function is now taken for granted as an inherent computer function.

Through Divyasampark, we focus on continuously evolving research in AI, to benefit different industries. Machines will be wired using a cross-disciplinary approach based on mathematics, computer science, linguistics, psychology, and more.

10.3. Machine Learning Powered Devices: The goal of machine learning technology is to optimize the performance of a system when handling new instances of data through user defined programming logic for a given environment. To accomplish this goal effectively and efficiently, machine learning draws heavily on statistics and computer science. Statistical methods provide machine learning algorithms ways to infer conclusions from data. Computer science methods, on the other hand, give machine learning algorithms (MLAs) the computing power to solve problems, including useful large-scale computational architectures and algorithms for capturing, manipulating, indexing, combining and performing predictions with data.

Divyasampark will aim at applying machine learning algorithms to analyze the data to extract the hidden patterns from it, which in turns helps in effective decision making. This in turn will help us in increasing the Technology Readiness Level for Machine Learning through productization and deployment, in areas such as medical diagnostics, consumer computer vision, satellite imagery, and particle physics.

10.4. Augmented and Virtual Reality Devices: It can be used for many use-cases:

(a)   help medical students learn before interventional procedures,

(b)   help surgeons plan their procedures and reduce errors,

(c)   disease simulation to enhance patient treatment and outcomes,

(d)   educate patients about the medical procedures and reduce their anxiety,

(e)   emergency care training for adult and pediatric scenarios in pre-hospital, general care, perioperative, and obstetrical settings,

(f)   help patients to enrich their knowledge about medical issues or assist them with drug intake processes by overlaying information regarding dose, schedule, and chemical component etc.

10.5. Industrial IoT: Connected devices are part of an ecosystem in which every device talks to other related devices in an environment to automate home and industry tasks. They can communicate usable sensor data to users, businesses and other intended parties. The devices can be categorized into three main groups: consumer, enterprise and industrial.

Consumer connected devices include smart TVs, smart speakers, toys, wearables and smart appliances. In a smart home, for example, devices are designed to sense and respond to a person's presence. When a person arrives home, their car communicates with the garage to open the door. Once inside, the thermostat is already adjusted to their preferred temperature, and the lighting is set to a lower intensity and color, as their smart watch data indicates it has been a stressful day. Other smart home devices include sprinklers that adjust the amount of water given to the lawn based on the weather forecast and robotic vacuum cleaners that learn which areas of the home must be cleaned most often.

Smart devices can help with meetings. Smart sensors located in a conference room can help an employee locate and schedule an available room for a meeting, ensuring the proper room type, size

and features are available. When meeting attendees enter the room, the temperature will adjust according to the occupancy, the lights will dim as the appropriate PowerPoint loads on the screen and the speaker begins his or her presentation.

Industrial IoT (IIoT) devices are designed to be used in factories or other industrial environments. Most IIoT devices are sensors used to monitor an assembly line or other manufacturing process. Data from various types of sensors is transmitted to monitoring applications that ensure key processes are running optimally. These same sensors can also prevent unexpected downtime by predicting when parts will need to be replaced.

If a problem occurs, the system might be able to send a notification to a service technician informing them what is wrong and what parts they will need to fix the problem. This can save the technician from coming on site to diagnose the problem and then having to travel to a warehouse to get the part needed to fix the problem.

10.6. Smart Grids: Through Divyasampark we will focus on growth and development of "Smart Grids". Smart grids indicate use of the digital technology that allows for two-way communication between the utility and its customers, and the sensing along the transmission lines is what makes the grid smart. Like the Internet, the Smart Grid will consist of controls, computers, automation, and new technologies and equipment working together, but in this case, these technologies will work with the electrical grid to respond digitally to our quickly changing electric demand. The Smart Grid represents an unprecedented opportunity to move the energy industry into a new era of reliability, availability, and efficiency that will contribute to our economic and environmental health. During the transition period, it will be critical to carry out testing, technology improvements, consumer education, development of standards and regulations, and information sharing between projects to ensure that the benefits we envision from the Smart Grid become a reality. The benefits associated with the Smart Grid include: more efficient transmission of electricity, quicker restoration of electricity after power disturbances, reduced operations and management costs for utilities, and ultimately lower power costs for consumers, reduced peak demand, which will also help lower

electricity rates, increased integration of large-scale renewable energy systems, better integration of customer-owner power generation systems, etc. We will aim at giving consumers control. The Smart Grid will not just be about utilities and technologies; it will be more about giving information and tools needed to make choices about our energy use. This smarter grid will enable an unprecedented level of consumer participation.

10.7. Metacomposites: Materials are continuously developed with the time being due to the necessity of human civilization and therefore advancement of each material in its highest classes is the best research necessity. The search for new and advanced materials is always an important subject for contemporary technological requirements and to make a product at optimum cost which is a basic consumer demand. New materials are continually developed, and materials properties improved in line with existing technological developments in order to meet safety and operational standards. Composites have developed continuously from its early to the advanced stages. The need and consumption of metal matrix composites (MMCs) continuously increasing worldwide with the time because of its high applications. A continuous need observed in industries which make the path to develop stronger lightweight material which having high efficiency and performance across a wide variety of industries. The product manufacturers are generally in need of lightweight, medium strength and less cost, for them aluminum metal matrix composites (AlMMCs) is an asset. AlMMCs for many engineering applications are seen as new generation potential materials. AlMMCs offer great promise for producing composites with the required properties for certain applications with a wide variety of reinforcing materials. The AlMMCs are evolved to obtain good mechanical and tribological characteristics with lightweight, based on specification and application requirements.

10.8. Radio Frequency: The hub will focus on advancement in the CPS through use of the Radio Frequency (RF) Technology. The RF technology can be useful in various areas like:

- **Communications:** Radio frequencies are used in communication devices such as transmitters, receivers, computers, televisions, and mobile phones, to name a few. Radio frequencies are also applied in carrier current systems including telephony and control circuits. The MOS integrated circuit is the

technology behind the current proliferation of radio frequency wireless telecommunications devices such as cellphones.

- **Medicine:** Radio frequency (RF) energy, in the form of radiating waves or electrical currents, has been used in medical treatments for over 75 years, generally for minimally invasive surgeries using radiofrequency ablation including the treatment of sleep apnea.

- **RF MEMS:** A **radio-frequency microelectromechanical system** (**RF MEMS**) is a microelectromechanical system with electronic components comprising moving sub-millimeter-sized parts that provide radio-frequency (RF) functionality. RF functionality can be implemented using a variety of RF technologies.

Polarization and radiation pattern reconfigurability, and frequency tunability, are usually achieved by incorporation of III-V semiconductor components, such as SPST switches or varactor diodes. However, these components can be readily replaced by RF MEMS switches and varactors in order to take advantage of the low insertion loss and high Q factor offered by RF MEMS technology. In addition, RF MEMS components can be integrated monolithically on low-loss dielectric substrates, such as borosilicate glass, fused silica or LCP, whereas III-V compound semi-insulating and passivated silicon substrates are generally lossier and have a higher dielectric constant. A low loss tangent and low dielectric constant are of importance for the efficiency and the bandwidth of the antenna.

10.9. **Cyber security of CPS devices**- Hub plans to create on test bed for the cyber security of various CPS devices. This center should be able to verify the security aspect of any CPS device at the hardware level.

11. BUDGET SUMMARY

Budget Head	Year 1 (cr)	Year 2 (cr)	Year 3 (cr)	Year 4 (cr)	Year 5 (cr)	Total (cr)
Recurring Cost	12.25	25.00	25.00	16.00	13.25	91.50
Non-Recurring Cost	8.00	10.00	15.00	6.00	4.5	43.50
Total Cost	**20.25**	**35.00**	**40.00**	**22.00**	**17.75**	**135.00**

TIH Manpower Budget Summary

Designation	Month Rate (Rs.) *	No.	Year 1	Year 2	Year 3	Year 4	Year 5	Total
CEO	225000	1	27	32.4	38.88	46.656	55.9872	**200.93**
Program Manager	108000	2	25.92	31.11	37.33	44.79	53.75	**192.9**
IT expert	81000	1	9.72	11.67	14	16.8	20.16	**72.35**
Investment manager	81000	1	9.72	11.67	14	16.8	20.16	**72.35**
Finance and Planning Officer	81000	1	9.72	11.67	14	16.8	20.16	**72.35**
Project Assistants/ asst. managers	54000	8	51.84	62.21	74.65	89.58	108	**386.28**
Associate	21600	5	12.96	15.56	18.67	22.4	26.88	**96.47**
Grand Total (in Lakhs)			**146.88**	**176.29**	**211.55**	**253.86**	**304.63**	**1093.63**

Skill Development	Rate with HRA	Number	Year 1	Year 2 (3 each)	Year 3 (3 each)	Year 4 (6 each)	Year 5 (6 each)	Total
Faculty fellows	162000	6	0	58.32	58.32	116.64	116.64	**349.92**
Chair Professor	183600	6	0	66.096	66.096	132.192	132.192	**396.576**
Grand Total (in Lakhs)			**0**	**124.416**	**124.416**	**248.832**	**248.832**	**746.496**

12. MANAGEMENT
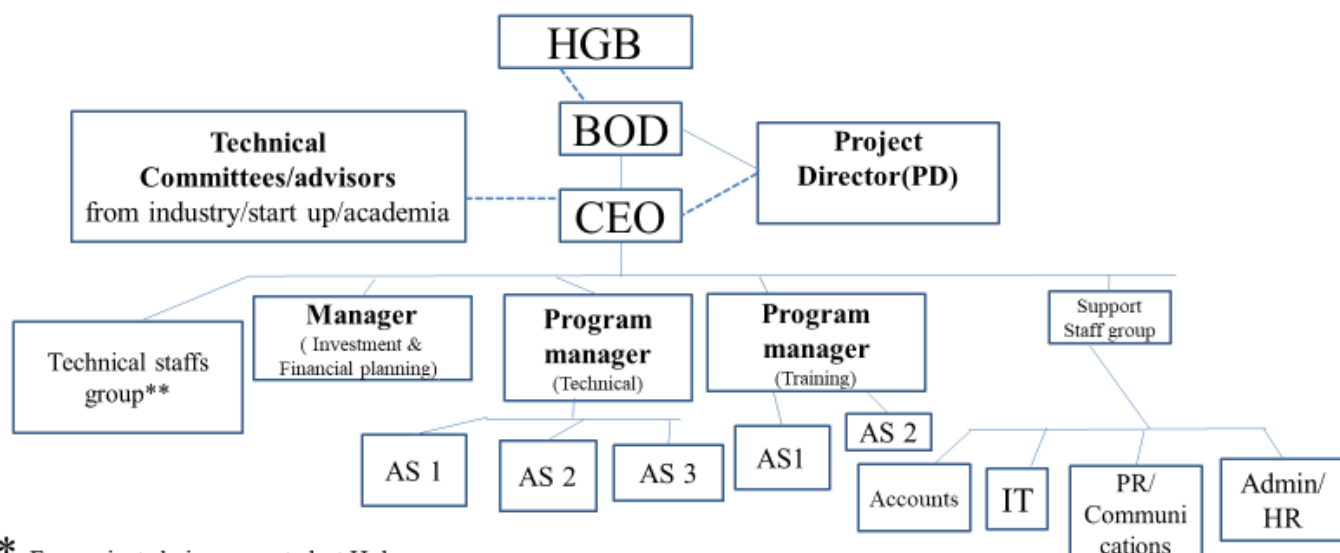
** For projects being executed at Hub

- Technical Committees/advisors to be appointed based on the projects requirement
- Currently HGB consists representative from academia, industry and host institute
- BoD may be further expanded by including representatives from Industry, start-ups, academia(non host institutes)

A Professor In-charge for Divyasampark has been appointed as Project Director, with experience in commercialization and industry relations related to CPS- Devices and Materials. The Project Director will primarily be responsible for outreach and evangelizing Divyasampark and, will build its relationships with the external and internal academic collaborators. A full-time Chief Executive Officer has also been appointed to manage the operation of the Hub and execute on the strategy set by HGB by working closely with Project Director.

Divyasampark has constituted its HGB keeping personnel from academic, Industry as well as Govt./PSUs for better outputs. On similar pattern, Divyasampark may also expand its Board of Directors.

Also, the Chair Professors/ Faculty Fellows will be appointed as Advisors/ Technical Committee from time to time based on project requirements.

Besides this, in order for the hub to work efficiently, effectively and transparently, we have developed our HR policy, purchase and store rules. Also, we have almost finalized our IPR policy, to make it more consistent with the mandates of the hub, keeping in mind the best interest of the creator/innovator.

12.1 <mark>HR POLICY</mark>

iHUB DivyaSampark will aim at creating a strong and transparent system for recruitment.

I. MANPOWER REQUISITION POLICY

Manpower requirements will be given in the prescribed Manpower Requisition form to HR. All requirements will be processed on approval by the CEO.

II. RECRUITMENT POLICY (Including Walk in Interview)

1. CREATING A POSITION

i. Creation of positions for a period of minimum 1 Year (renewable on performance basis till the completion of the project under National Mission on Interdisciplinary Cyber Physical System by Department of Science & Technology) as detailed in the Detailed Project report (DPR). It needs to be approved by the BoD of Divyasampark iHUB Roorkee for Devices Materials and Technology Foundation.

ii. However, the CEO can recruit someone directly on an Adhoc basis for a period of 89 Days after approval by the Project Director.

2. PREPARATION OF DRAFT ADVERTISEMENT

i. The CEO will send the draft advertisement to the Board of Directors for approval.

ii. The Board of Directors will approve the draft advertisement and return it to the CEO for notification/ advertisement to be published on DivyaSampark's website for Senior level positions.

3. RECRUITMENT PROCESS

i. Mode of applications: Online/Offline applications may be invited.

ii. Stages in Selection Process:

  o The selection committee may follow a multistage screening process that may include application screening, telephonic screening, in person/online interview, reference checks, etc.

- The selection committee recommends the hiring and the duration of appointment at a position based upon the hiring process.

- The final hiring is approved by the Board of Directors of the company for senior positions at managerial/CEO level or higher or equivalent position(s). For other positions, Project Director of Divyasampark iHUB Roorkee may approve.

4. ADVERTISEMENT OF THE POSITIONS

The advertisement shall be displayed on Divyasampark website. Advertisement will be done through other means like Facebook posting, LinkedIn, jobs websites like naukri.com/indeed.com etc.

5. SCREENING OF APPLICATIONS

i. The CEO will fix the meeting of the Screening Committee and send the report of the screening committee to the Board of Directors for approval.

ii. Internal screening like eligibility criteria, education etc.) would be done by HR/TIH Team.

iii. The HR will issue the letters to the candidates called for interview after the Screening Committee report should be approved by the Board of Directors.

iv. For a walk-in interview, screening is not required.

6. SCREENING COMMITTEE CONSTITUTION

(i) Chief Executive Officer (CEO) or Nominee of CEO   Chairman

(ii) Project Director   Member

(iii) HR Head   Member

7. INTERVIEW

i. The CEO will fix the date of the interview and get the interview conducted.

ii. The CEO will send the recommendations of the Selection Committee to the Board of Directors for approval.

iii. The CEO will arrange the walk-in-interviews on the advertised date by a duly approved Selection

Committee

8.   SELECTION COMMITTEE CONSTITUTION

i.   A selection committee to be constituted for hiring against an approved position by the BoD of the company.

ii.   For hiring at CEO/Senior level or higher or equivalent position, the candidates will be presented and interviewed by the Board of Directors along with other experts.

iii.   The selection committee should include atleast three members that may include:

- Board of Directors of Divyasampark iHUB Roorkee for Devices Materials and Technology Foundation,

- TIH affiliated faculty or IIT Roorkee faculty members,

- Project Director, and or

- External invited members.

iv.   For hiring at Mid-Level, the candidates will be presented and interviewed by the Project Director, CEO, iHUB DivyaSampark official, IIT Roorkee or Other IIT Faculty. For other positions, the selection committee may comprise of Project Director, CEO and HR Head.

*** *Hiring Under Projects*:**

For hiring under Projects, the candidates will be presented and interviewed by the following Four Member Selection Committee:

1.   PI or Nominee of PI, whose expertise is matching with the skill and areas of person to be hired.
2.   CEO, iHUB DivyaSampark or Nominee of CEO.
3.   Technical expert suggested by PI.
4.   Technical expert suggested by CEO

9.   FINAL SELECTION /APPOINTMENT

i.   For Senior position, the Selection Committee report will be approved by the Board of Director and an appointment letter will be issued by the CEO.

ii.   For other it will be approved by Project Director.

III. EMPLOYEE REFERRAL SYSTEM

We have an employee referral system for certain key positions whereby employees are recruited through employees' reference.

The current openings will be informed from time to time to individual staff/ departments/organization, solely as per management decision only.

Referral Incentives are as below:

i.   For Junior positions - Any department & location - Rs. 3,000/- per referral.

ii. For Mid-level positions - Any department & location - Rs. 4,000/- per referral.

iii. For Senior Level positions - Any department & location - Rs. 5,000/- per referral.

"When the preferred candidate joins, a Referral letter shall be issued to the employee & the incentive amount would be payable after completion of 180 days (i.e., 6 months) of service by the new joinee. "

This scheme is open to all employees.

Please note, in order for you to avail this benefit & for us to have a record, all referrals should strictly be routed through HR on time & along with the referral form attached. Hard copies will only be accepted.

IV.   APPOINTMENT AND GENERAL CONDITIONS OF EMPLOYMENT

Terms and conditions of employment depend upon the nature of appointment and are mentioned in the appointment letters. Appointment letters are issued to new employees as either temporary, trainee, probationary or permanent, contractual depending on various factors like experience, qualifications, skills set, requirement and nature of job etc.

i.   Before the offer letter is released, HR should be in possession of the following documents:

a) Resume of the candidate

b) Interview assessment Sheet

c) Clearance from the pre-employment checks

d) Photo ID proof

e) Copy of the last revision letter / appointment letter incase no revision has been done.

ii. Process :

Three days before the date the candidate is supposed to join, HR will inform the team.

    a) Admin department (to ensure seating space / Joining kit)

    b) IT department for allocation of desktop / laptop.

    c) On the date of joining, Manager should welcome the new entrant in the organization and communicate the joining intimation to the HR for initiation of mail Id and employee number

d) The candidate is expected to carry the following documents on the date of joining:

- Certificates supporting academic/professional qualifications (self-attest copy of documents).

  o SSC/10th Class - Certificate along with the mark sheets

  o Intermediate/12th Standard - Certificate along with the mark sheets

  o Bachelor's Degree – Certificates along with the semester/year wise mark sheets

  o Masters / Professional Degree - Certificates along with the semester/year wise mark sheets

  o Diploma / PG Diploma – Certificate along with the mark sheets

  o Any other relevant academic certificates

- Latest salary pay slip / Proof of Salary.

- Relieving letter from last employer

- Service Certificate.

- Form 16 (OR) Taxable Income Statement duly certified by the previous employer. (Statement showing the deductions & Taxable Income with break-up) (if applicable)

- 4 recent passport color photographs.

- Valid ID Proof - Aadhaar Card/Passport/Voter ID.

  o Photocopy of valid passport inclusive of all blank pages (or)

  o Receipt in proof as issued by the passport office, in case applied for the passport.

- Photocopy of the PAN Card. (if applicable)

- Reference by previous Employer (if any)

- PF Account No. (if applicable).

- Photocopy of the APPOINTMENT LETTER as issued by iHUB DivyaSampark

- Physical fitness certificate from Chief Medical Officer of IIT Roorkee or Chief medical Office of any District Government Hospital.

e) The new joinee is expected to collate all above documents and send it to iHUB DivyaSampark HR. On receipt of all these documents, the original copy of the appointment letter will be dispatched to the employee along with the joining letter. These would include the following:

- Joining Letter

- Contract with Terms & condition (Information and data security undertaking, Acceptance of Code of Conduct & Non – Disclosure Agreement.)

- Police Verification

- Declaration of relatives in iHUB DivyaSampark.

- Medical Facility / PF Nomination (if applicable)

- Appointment letter

f) The iHUB DivyaSampark HR / Administration are also responsible to coordinate on the ID card, visiting card and salary account opening formalities.

V. EQUAL OPPORTUNITY FOR ALL

iHUB DivyaSampark is committed to a work environment in which all individuals are treated with respect and dignity. Each individual has the right to work in a professional atmosphere that promotes equal employment opportunities and prohibits unlawful discriminatory practices.

Therefore, iHUB DivyaSampark believes that everyone has the right to work. An employee irrespective of their race, color, religion (creed), gender, gender expression, age, national origin (ancestry), disability, marital status, sexual orientation, or military status, in any of its activities or operations who can perform the core functions of the jobs, with or without reasonable accommodation, is entitled to the same protection and respect as other employees.

**Will follow the government rule as and when applicable.

<u>ANTI-HARASSMENT POLICY AND COMPLAINT PROCEDURE (INCLUDES</u>

<u>DATING/CONSENSUAL RELATIONSHIP POLICY PROVISION)</u>

iHUB DivyaSampark expects that all relationships among persons in the office will be business-like and free of explicit bias, prejudice and harassment.

iHUB DivyaSampark has developed this policy to ensure that all its employees can work in an environment free from unlawful harassment, discrimination and retaliation. iHUB DivyaSampark will make every reasonable effort to ensure that all concerned are familiar with these policies and are aware that any complaint in violation of such policies will be investigated and resolved appropriately.

- ❖ This policy is in accordance with the provisions of "The Sexual Harassment of Women at Workplace (Prevention, Prohibition, and Redressal) Act, 2013". The purpose of this policy is to prevent sexual harassment against women in the workplace and also to protect them. Every company aims to provide a safe working environment for all people.

- ❖ This policy is applicable to all the members of the company including employer and those who are employed on regular, temporary, on a daily wage basis, etc.

- ❖ The policy also extends to those who are not employees of the company such as customers, clients, visitors, interns, contract workers, suppliers, etc.

- ❖ This policy is restricted to the business locations of the company and any external location visited by the employees during the course of employment whether inside or outside of India.

- ❖ All the employees should have the personal responsibility to ensure that their behavior is not in contravention with the policy.

i. Prohibited Conduct Under This Policy

iHUB DivyaSampark, in compliance with all applicable federal, state and local anti-discrimination and harassment laws and regulations, enforces this policy in accordance with the following definitions and guidelines:

a) Discrimination

It is a violation of iHUB DivyaSampark's policy to discriminate in the provision of employment opportunities, benefits or privileges; to create discriminatory work conditions; or to use discriminatory evaluative standards in employment if the basis of that discriminatory treatment is, in whole or in part, the person's race, colour, national origin, age, religion, disability status, sex, sexual orientation, gender identity or expression, genetic information or marital status.

Discrimination in violation of this policy will be subject to disciplinary measures up to and including termination.

b) Harassment

iHUB DivyaSampark prohibits harassment of any kind, including sexual harassment, and will take appropriate and immediate action in response to complaints or knowledge of violations of this policy. For purposes of this policy, harassment is any verbal or physical conduct designed to threaten, intimidate or coerce an employee, co-worker, or any person working for or on behalf of iHUB DivyaSampark.

c) Sexual harassment

Any behavior which may be physical, psychological, graphical, emotional, verbal, written, electronic, gestures which are offending, etc. is defined as inappropriate by the policy. Any act of the person either intentional or not, should not offend the dignity of the other person. If done so then serious disciplinary action is taken against the person who has performed such act. **Sexual harassment (direct or by implication) includes:**

- Any kind of unusual and unwelcome sexual requests or demand for sexual favors in return for employment, promotion, examination or evaluation of a person.

- Stalking, displaying indecent posters, showing pornography, sending jokes, comments, messages which are inappropriate and sexual in nature, lurid stares, physical contact or molestation, inappropriate sounds, signs, questioning about person's private life or body, insults or taunts based on sex or any kind of communication either verbal or non-verbal which affects the performance of the individual.

- Physical confinement against one's will and likely to interrupt the privacy of the person.

- Any act or conduct by a person who is in authority, which creates the environment at workplace hostile or intimidating to a person belonging to the other sex.

d) Retaliation

No hardship, loss, benefit or penalty may be imposed on an employee in response to:

- Filing or responding to a bona fide complaint of discrimination or harassment.
- Appearing as a witness in the investigation of a complaint.
- Serving as an investigator of a complaint.

Lodging a bona fide complaint will in no way be used against the employee or have an adverse impact on the individual's employment status. However, filing groundless or malicious complaints is an abuse of this policy and will be treated as a violation.

Any person who is found to have violated this aspect of the policy will be subject to discipline up to and including termination of employment.

e) Confidentiality

All complaints and investigations are treated confidentially to the extent possible, and information is disclosed strictly on a need-to-know basis. The identity of the complainant is usually revealed to the parties involved during the investigation, and the HR director will take adequate steps to ensure that the complainant is protected from retaliation during and after the investigation. All information pertaining to a complaint or investigation under this policy will be maintained in secure files within the HR department.

f) Complaint procedure

iHUB DivyaSampark has established the following procedure for lodging a complaint of harassment, discrimination or retaliation. The company will treat all aspects of the procedure confidentially to the extent reasonably possible.

ICC (Internal Complaint Committee):

Every company in which there are 10 or more employees must have ICC and all the complaints regarding sexual harassment are dealt with the committee. The ICC should comprise of 4 members among them half of the members will necessarily have to be women.

4 members of ICC:

1. A presiding officer or women working at a senior level in the office

2. Any member who is committed to the cause of women

3. Any member of the company who has legal knowledge and experience in social work

4. Any external member for example NGOs, any person familiar with issues related to sexual harassment.

If in a company, there are less than 10 persons then no need to form a committee and in this case all the complaints go to the local complaints committee which is set up by district officers in every district as per the Act.

The complaints committee is responsible for receiving and investigating every complaint of sexual harassment, submitting findings and recommendation of the inquiry to the employer and coordinating with the employer before implementing any kind of appropriate action. The committee is also responsible to maintain confidentiality throughout the process. It is the duty of the employer to provide a safe working environment and conduct awareness programs regarding the prevention of sexual harassment and provide necessary assistance and facilities to the committee in dealing with the complaints.

Procedure for dealing with complaints:

The complaint is needed to be lodged within 3 months from the date of incident along with any documentary evidence or names of witnesses if available. The committee can also extend the timeline to another 3 months if it is satisfied with the reasons which prevented the lodging of a complaint within the first 3 months. The complaint shall be in any form wither through phone or email but every oral communication should be followed up with the written communication and in any case where a complaint cannot be made in writing then the presiding officer or any member of the committee shall assist the person for making the complaint in writing.

In case if an aggrieved person is unable to lodge the complaint then any person who is having knowledge of the incident or any family member/ relative/ friend or co-worker can lodge the complaint on behalf of his/her. It is the responsibility of the person who receives the complaint should inform the committee members.

ICC can try and make parties to settle but monetary compensation is not the basis for settlement. If the aggrieved person is not ready to settle, then ICC will inquire into the complaint and both the parties will get a chance to be heard and complete the inquiry within 90 days. After the inquiry, if the person who committed such act is found guilty then Corrective action is taken by

the appropriate authority. Corrective action includes:

- Formal apology.

- Transfer of the person to another department.

- Suspension or termination of services of the employee found guilty for such offence.

- Counselling

- A written warning to the concerned employee and a copy of it are maintained in his record.

Reliefs to victims:

o Monetary compensation

o Grant leave for 3 months

o Transfer the victim to any other department where he/she feels safe to work

Penalty:

If the employer does not comply with the law, then fine of Rs. 50,000/- can be imposed. On repeated non-compliance of the law employer can be penalized with twice the punishment. Non-compliance can also lead to cancellation of licence, withdrawal or non-renewal of registration for carrying on business, by the Government.

g) Alternative legal remedies

Nothing in this policy may prevent the complainant or the respondent from pursuing formal legal remedies or resolution through local, state or federal agencies or the courts.

VI. HIRING OF RELATIVES

i. To ensure that wherever employees related to each other are working in the organization, they are not in a position to influence the jobs, performance or career progression of one another.

ii. The company's recruitment philosophy is hiring purely on merit. There is no restriction on

hiring of relatives till such time it does not create a potential conflict of interest. But if organizational strength is less than 20, the hiring of relative would be discouraged as it would be practically impossible to avoid conflict of interest due to cross functioning of actual job for each employee.

iii. In order to avoid potential conflict of interest and to reduce the possibility of favoritism or appearance of favoritism, the following guidelines must be followed:

a) No one is assigned to a position where he/she has the opportunity to check, process, review, approve, audit or otherwise affect the work of the other related employee.

b) No one is assigned to a position where he/she can influence the salary progress or promotion of the related employee.

c) In case any employee knows of a situation that appears to be an opportunity for one employee to show favoritism to his/her relative, he/she should contact the iHUB DivyaSampark HR.

iv. Examples of relatives, for the sake of understanding is Parents / In-laws, spouses, Children, Siblings/Cousins etc. However, the list is not limited to relations defined above.

v. Process:

a) The HR department maintains data on related employees and updates them on a monthly basis. This list is to be reviewed by HR/Compliance **on a quarterly basis.**

b) All new hires must declare in their joining kit, if they have any relatives working with the iHUB DivyaSampark to the best of their knowledge.

VII. NOTICE PERIOD

To protect the interest of the organization during separation of employees.

The notice period will be as per the grid below: -

Level	On	On
	probation	Confirmation
Junior Employees		
Mid Employees		
Senior Employees	Nil	30 days

The company reserves the right to not accept compensation in lieu of notice period and make the employee serve partial or entire notice period. However, in the event an employee's services are terminated for fraud, theft or withholding of information or for any other form of misconduct, notice period will not be payable.

On account of outstation candidates, a VC should be preferred over a telephonic interview.

VIII. HOUSE RENT ALLOWANCE:

Employees who have not been allotted accommodation by the Company will be paid house rent allowance as per the IIT Roorkee norms. This benefit should reflect in the offer letter.

IX. GENERAL POLICIES

i. General Working Hours:

a) The core working hours would be between 9.00 a.m. to 5.30 p.m.

b) Depending on work exigencies, employees may be required to work beyond the above-mentioned timings.

c) There are no designated coffee-breaks. Employees should use these in a responsible manner.

ii. Weekly Off:

Saturday and Sundays would be observed as the weekly off.

**However, looking at the nature of work, Company may ask the employees & other staff to come on weekends.

iii. Office Decorum:

a) All employees are required to be co-operative, organized, disciplined and contribute to the overall office ambience in a positive manner.

b) All telephone interactions with outside clientele, vendors should be handled in a professional and courteous manner.

c) Every employee shall take proper care to keep his surroundings clean.

d) Smoking is strictly prohibited in the office premises, even after working hours.

e) Work space should be neat at all times particularly at the end of the day.

f) All visitors are seated only in the discussion room & not allowed entry in the workplace, unless unavoidable or if required.

g) Avoid unnecessary loitering / hanging around individually or in groups, in the office or at each other's workstation. Preferably use an intercom for communication.

h) Employees away from their seats for longer intervals, may please switch off the lights, fans, computers / monitors, etc., that are being used by them.

i) Unwanted waste papers be trashed & not being kept / thrown on empty desks or around printer areas.

j) For working on off days, it will be good if you will intimate the same if you are working at office to the official whats app group or mail to CEO/HR.

k) The compensatory off can be availed only within a period of two months.

l) Please attend to office phones around you in the absence of the concerned person & keep the ring tone of your mobile decent & volume appropriate.

m) Needless to say, employees found ignoring or flouting the above would call for appropriate action.

X. LEAVES:

i. Authority Empowered to Sanction Leave:

a) Applications for leave shall be addressed to the Chief Executive Officer by the other members of the team and the Chief Executive Officer can address leave to the any Board Member to whom the power has been delegated, as the case may be.

b) Leave may be sanctioned by the Chief Executive Officer or any board member to whom the power has been delegated, as the case may be.

c) The intimation copies for the same should be send via mail to HR.

ii. Commencement and Termination of Leave:

a) Leave ordinarily begins from the date on which leave as such is actually availed of and ends on the day preceding the one on which duty is resumed.

b) Sundays and other holidays or the vacation may be prefixed as well as suffixed to leave, subject to any limit of absence on leave prescribed under each category of leave.

**This may be relaxed if approved in advance by CEO or the Competent Authority.

iii. Rights of Leave:

Leave cannot be claimed as of right and when there is an urgent demand or need, leave of any description may be refused or revoked by the authority empowered to sanction the leave.

iv. Extension of Leave:

Any extension of Leave should be informed well before expiry of the already sanctioned leave and such extension is valid only if such extension is approved by CEO.

We observe the leave year pattern of January – December for calculation of the below mentioned leaves.

❖ Each employee would be eligible for:

o Earned Leave - 18 Days per Year

o Sick Leave – 7 days (cannot be encashed)

o Hospital Leave – As per recommendation of the competent authority of iHUB DivyaSampark.

o Quarantine Leave – 21-30 days

o Casual Leave – 8 days per year (cannot be encashed)

o Maternity Leave – 135 days

o Paternity Leave -15 days

o Marriage Leave – 10 Working Days

o Extraordinary Leave

A. SICK LEAVE

The employee must inform his / her manager at the earliest in case he / she is unable to attend to work on any specific day. In all such situations, the employee should inform his / her manager of the ailment and the period he / she is likely to be absent from the work. The sick leave must be regularized at the earliest.

1. If the sick leave is of three days or more, the employee should submit a registered medical practitioner's certificate along with the sick leave application.

2. If the nature of illness is prolonged necessitating sick leave over and above the entitlement, the employee can use his Earned Leave entitlement for the shortfall. If there is still a shortfall, the Company may at its discretion allow the employee "sick leave" with pay.

3. The company may at its discretion and depending on the circumstances may ask any of the employees on sick leave to get a medical checkup done by a Company specified

Doctor, before approving the Sick Leave.

B. EARNED LEAVE

Employees on completion of One year will be eligible for 18 days earned leave. Earned leave for a period less than 1.5 day per month is not permissible.

1. EL will be accrued to employees' accounts at the end of each calendar year.
2. Employees on probation cannot avail EL, though the accrual will be on pro-rata basis from the date of joining.
3. Advance EL would be sanctioned up-to the limit of that accrued till the date of application.

C. LEAVE ENCASHMENT

Earned Leave can be carried forward up to 42 days only beyond which it will lapse. Leave encashment for Earned Leave can be availed only in the event of separation from the organization and not during the tenure of employment. It is worked out on the basis of Basic salary on a 30-day month.

D. COMPENSATORY LEAVE

Compensatory leave can be granted on the case-to-case basis.

E. HOSPITAL LEAVE

- If any employee is hospitalized for 1 month – 1 Month Full salary will be given.
- If any employee is hospitalized for more than 1-month Half salary will be given till next three months.

F. EXTRAORDINARY LEAVE

Extraordinary leave may be granted on case-to-case basis by CEO/HR.

G. MATERNITY LEAVE

All female employees can avail of 135 days of maternity leave for maximum 2 occasions during their tenure with iHUB DivyaSampark.

Application for Maternity leave needs to be made at least 2 months prior to proceeding on leave. This application needs to be supported by a certificate issued by a Registered Medical Practitioner indicating the likely date of delivery.

In case of miscarriage or premature delivery, 45 days of Maternity Leave can be availed of after the event. Application for Maternity leave should be supported by a Medical Certificate indicating the exact date of the event.

H. PATERNITY LEAVE

All male employees can avail of 15 days of paternity leave within a month of his spouse's delivery for maximum 2 occasions during their tenure with iHUB DivyaSampark after submitting a certificate issued by a Registered Medical Practitioner indicating date of delivery.

I. WOMAN-FRIENDLY COMPANY CULTURES

"Company culture" is a tricky one to define, but we at iHUB DivyaSampark will create a culture and environment that will be very conducive to women employees.

J. FLEXIBLE WORKING OPTIONS

Flexible working policies include the option to work from home, when necessary, job share or working part-time hours, and flexible working hours.

This should be availed in a way so that company performance is NOT compromised.

K. ANNUAL COMPULSORY WEEK OFF

This week off is mandatory for all the employees to take. Since work may get disrupted if

a team member goes on extended leave, this type of leave needs to be planned ahead of time, and the team or CEO/HR informed about it in advance.

v. Non-Availed Leave

- Non availed CL will lapse after 31st December and cannot be carried forward to the new leave year.

- Sick Leave can be carried forward to the New Leave year, up to a balance of 28 days, over and above which sick leave would lapse.

vi. Rules for Availing Leave

- Not more than 3 CL's can be availed at a stretch.

- CL cannot and EL (earned leave) cannot be clubbed together.

❖ LIST OF PAID HOLIDAYS

The list of national holidays and festival holidays would be announced every year in the last week of the preceding year.

XI. TRAVEL POLICY

a) Travel

To facilitate the travel of employees for business purposes by reimbursing specified expenses in such a manner that the travelling arrangements are comfortable and productive.

All employees who travel on Company business will be covered under this policy. Trainees and consultants will also be covered.

The employees are to use the company's preferred hotels for their stay while on business trips and ensure that the appropriate corporate discounts are extended to them while settling the bills. For convenience, and better planning the Administration department

should be consulted.

The following rates are applicable to the employees. Any deviation needs to have a prior approval from the Director/CEO.

** For Faculty fellows and Chair Professor – Travel allowance rules shall be applicable as per senior level.

City Classification for Cities

GRADE	CITIES
A	Madras, Bangalore, Calcutta, Bombay and Delhi
B	Ahmedabad, Aurangabad, Baroda, Bhubaneshwar, Chandigarh, Cochin, Coimbatore, Hyderabad, Indore, Jaipur, Madurai, Nagpur, Nasik, Pondicherry, Pune & Trivandrum.
C	All others

b)   HOTEL STAY ALLOWANCES i.e., HSA (inclusive of Taxes)

EMPLOYEES A	B	C
For Junior Employees	4000	2500	2000
For Mid Employees	5000	3000	2500
For Senior Employees (Including Directors of the Company	At actuals		

*Deviation allowed in prices on the place-to-place basis.

- The employee must submit bills for single room accommodation. In the case where an

  employee is accompanied by a spouse on the business trip, the employee must pay the

  differential rate of taking double accommodations and related expenses.

- Any complimentary meals provided by the hotel must not be charged in the daily meal

  allowances.

- In occasional cases where employees may not be able to produce bills for food, 50% of

  the above Hotel stay allowance can be claimed for that day, without producing any bills.

- The claims for an entire day should be either with bills.

c)   MISCELLANEOUS ALLOWANCE

Employees under all categories who are travelling out of station are allowed to claim

Rs.500/- per day towards miscellaneous expenses like mineral water, newspaper.

d)   FLAT RATE ALLOWANCE

i.   Flat Rate Allowance is applicable only when an employee makes his own stay arrangement.

ii. Employees can claim FA instead of HSA without producing any bills /vouchers. **When an employee claims FA no other allowances can be claimed.**

iii. For the same day return field trips to client locations over 45 kms one way.

EMPLOYEES	A	B	C
For Junior Employees	1000	750	500
For Mid Employees	1200	900	700
For Senior Employees (Including Directors of the Company)	1500	1100	900

IMPORTANT

- Cigarette and Liquor expenses will not be reimbursed.

- Staying at one's permanent residence will attract no Allowances except for Misc. Allowance and conveyance at actuals.

- Employees should preserve for submission relevant receipts / tickets to facilitate processing claims.

- In case tickets and supporting vouchers for travel fare are not produced, the lowest applicable fare will be considered for processing claims.

e) TRAVEL ADVANCES

a) Travel advance may be drawn by the employee to meet anticipated business expenses during the period of travel after excluding expenses, which would be directly taken care of, by the company and should be intimated to Accounts two days before travel.

b) Employees who have taken travel advances should clear all food, laundry, telephone bills directly at the hotel.

c) Advances would be granted on submission of Travel Form, duly signed by the competent authority.

d) The company would not grant a further advance till such time the earlier advance is cleared, unless in exceptional cases wherein approval from the Competent authority is mandatory.

f) TRAVEL REIMBURSEMENT

a) INTERCITY TRAVEL (OFFICIAL TRAVEL) RATE OF REIMBURSEMENT

EMPLOYEE GRADE MODE OF TRANSPORT

For	Volvo/AC Bus/IIIrd AC Train

Juniors	
For Mid	Train/ Ist A/C (Rajdhani) / AC Bus / Shared Cab/Air-Economy/II AC Train
For Seniors	Rental Cab /Air Economy

b) INTERNATIONAL TRAVEL (OFFICIAL TRAVEL) RATE OF REIMBURSEMENT

- As a policy, air travel for short distances (less than 300 km) is not allowed except at senior level.

- For residential training programs, and in cases where the arrangements have been made by the Company for HSA, the employee will not be entitled to reimbursement of expenses incurred.

  **We will follow international travel policy as per the IIT Norms and it can be modified on the case-to-case basis.

g) MODE OF TRANSPORT

(Within the city – official Travel)

With the prior approval from the CEO the amount of Rs. 500/month can be claimed for office day to day travel by Support staff/Multi-Tasking Staff.

h) TRAVEL PROCEDURE:

- The employee should fill in the Travel Form and get the travel plan approved by the competent authority.

- The employee should hand over a copy of the Travel Form to Admin at least a week in advance, to enable arrangements to be made.

- The employee should submit the Travel Expenses Statement and Tour report to F&A within 7 days of return from tour, duly supported, with bills/ vouchers / cash memos etc.

- Any air ticket that is unused should be returned to Admin immediately on return.

- Any deviation to this policy would require prior approval from the CEO.

- All travel has to be authorized by the competent authority. No deviations from the policy shall be entertained unless duly authorized by the CEO.

- Only billing statements or summary will not be accepted as supporting claims. If supporting vouchers are not available, the expense shall be disallowed.

i) CLAIM SETTLEMENT

    i. All claims duly approved by the CEO or the competent authority, for a particular business trip must be submitted to the accounts department by the employee giving complete details of the expenses incurred within seven days of return from the business trip.

    ii. All expenses are required to be in line with the policy laid. If any expenses claimed are over and above the policy amounts, such expenses would require an approval of the CEO/ Project Director. Expenses not subject to their approval would be disallowed.

XII. INTERNET CONNECTION

During the COVID 19 pandemic or any other reason that is justified, working from home was as important as working from the office. So, this is for the employees who were facing an issue while working from home because of no internet connection, if their work is suffering, they can reimburse their one-time internet connection bill with valid reason and approval for the same from the CEO is required.

XIII. ASSET RECOVERY POLICY-

These are company assets and are issued to certain employees based on their roles and work profile.

Employees are responsible for the general maintenance and upkeep of the assets. Employees are expected to take care of these assets during travel and general handling.

- o In the event of finding that an asset issued to an employee was lost or misplaced due to negligence or mishandling, then the organization reserves the right to recover the amount from the employee.

- o In case of loss of Laptop, the Company will recover an amount equal to the depreciated value of the same/similar model on the date of loss or misplace of the laptop.

    **Depreciation charged -25% per year on straight line method.

- o For Pen drive, Net Card and any other assets- the same has to be returned to the competent authority.

- o In case the asset is found damaged, the same has to be returned to the competent authority and they will duly write off the asset.

XIV. PROVIDENT FUND

To comply with the statutory regulations governing employee provident fund.

Eligibility

The benefit of Provident Fund is extended to all employees from the date of joining their services with the company under the Employee Provident Fund & Misc. Provisions Act, 1952.

The rate of contribution is as given below:

Employer's contribution: 12% of Basic salary per month Employee's contribution of 12%

of Basic salary per month

The contributions of both the employer and employee are operated through the monthly payroll. The monthly PF contribution for all employee of the company is deposited with the Regional Provident Fund Commissioner

An employee may increase his/her contribution under the Voluntary Provident Fund to a maximum of 20% of the Basic salary. (This is an internally set limit, though there is no limit set by the act). In such a case the concerned employee must inform the HR department about his/her decision to increase the contribution. This change can be effected only at the beginning of a new financial year.

The employer's contribution remains fixed at 12% of Basic Salary per month.

XV. INSURANCE

Health Insurance and Term life insurance is a prudent financial tool for companies looking to reward their employees

i. Employee health insurance is a benefit extended by an individual's employer to their employees. It does not only cover the person working for the employer but also covers the rest of family members under the policy.

ii. Employer provided life insurance is an arrangement where, the employer buys the life insurance plan and pays the premium for the benefit of the employee. Generally, this is a benefit given to only select employees by the company with the aim of attracting and retaining them for a long period of time. This life insurance is often confused with keyman life insurance, as these are both brought by companies for their employees. But employer provided life insurance is different in a way that the death benefit is paid to the employee's beneficiaries and not the company. Furthermore, the life insurance proceeds to the employee are tax free u/s 10(10D).

i. Employees who are working on the payroll of companies meeting the eligibility criteria can be given this policy. For employees, the minimum age for this policy is 18 years and the maximum is 60 years.

ii. Assured amount will vary on employee to employee pay scale.

Amendment or Discontinuance of Scheme:

The employer may discontinue the scheme at any time subject to 3 months' previous notice being given to the member and the corporation and the discontinuance shall be effective from the 20th of the month coincident with or following the expiry of the notice period.

Or

In the case of leaving the company, the employee's insurance will not be paid by the company, but, if the employee wishes to continue it, they can pay themselves directly for the insurance.

Group Health Insurance and Life Insurance may be considered.

XVI.   TECHNOLOGY USER POLICY

At iHUB DivyaSampark we believe that it is better to focus on the quality and quantity of work output rather than the amount of time an employee uses the Internet.To ensure that the company's equipment is properly used by various users and certain specified guidelines are followed.

Guidelines or policies are also needed to prevent the electronic disclosure of trade secrets and confidential information and to help prevent the personal use of electronic technology

from reducing employee productivity.

To allow the employee to understand what level of personal use is tolerated.

"You are given access to our computer network to assist you in performing your job. You should not have any expectation of privacy in anything you create, store, send, or receive on the computer system...Without prior notice, the company may review any material created, stored, sent or received on its network or through the Internet or any other computer network."

LISTED BELOW ARE SOME DO's and DON'Ts to help you understand the above:

i. <u>User Policy:</u>

a) Users are responsible for their own data, i.e., data on master1\users and data on their workstations. Keep a second copy of important files on master1\users and one on their machines. At all times, keep two copies of critical data files.

b) Do not share your hard drives as it may cause loss of data.

c) Antivirus updates are to be done as soon as mail is received from the Administrator.

d) Not to bring any hardware from outside.

e) Not supposed to open the systems without permission of the Administrator.

f) Not supposed to install any software without permission.

g) Don't keep any unwanted things on master1\users or any server.

h) NT password will be changed every 42 days.

i) Not supposed to delete any file or data of others without prior permission of particular data.

j) Visitors are not allowed to sit at and use the employee machine.

k) Users are supposed to only use software which they are authorized to.

ii. Cost Saving Measures:

a) Photocopy Prints.

b) Avoid Color Prints.

c) Print at Low resolution.

d) Print on both sides of paper.

e) Preview your page – **Always.**

f) Switching of light, AC's and other power-hungry devices.

g) Switch off your PCs in Non-working Hours/ Coffee breaks/ Lunch.

Users are requested to co-operate and adhere to these norms. Violators of the policy would be strictly dealt with.

XVII.   BUSINESS / VISITING CARDS and Identity Cards

Business /Visiting cards and ID cards are provided by the company to all employees who are required to visit other offices.

The design of the business card is common for all categories.

Name and designation of the employees is printed on the card along with Company logo, address, telephone numbers, e-mail id, company website and mobile nos. Requisition of such cards should be forwarded to the HR & Admin Department.

XVIII.   TRAINING AND DEVELOPMENT

i.   PROFESSIONAL GROWTH

There is no restriction/ limit for growth in the organization. Growth is linked to performance, potential and organizational requirements.

Whereas employees are the main success factor for any start-up or organization (even if it

is a section 8 company) especially if the nature of business is service oriented. If iHUB DivyaSampark can create that culture of openness, care and reward for excellence then its employees would be highly motivating.

The employee should be encouraged to identify suitable avenues for his / her growth. Career path is determined by the employee as well as the organizational need.

The organization would periodically assess its employees for grooming them for more responsible and key positions in the organization. Job rotations will also be encouraged.

ii. TRAINING

Training is an ongoing process. We will arrange both internal and external training.

The employee as well as the organization identifies the training needs of each employee, which is decided jointly by the employee and senior employee of the organization.

An annual Training Calendar is drafted based on the training needs and recommendations and an annual budget is adhered to. Employees will be nominated to various training programs by the CEO or HR.

Training is not limited to formal training sessions, but will also include on the job and informal training opportunities – like learning sessions to be conducted in house.

iii. PROCEDURE FOR TRAINING TO BE UNDERTAKEN

- Details of training program (brochures etc) along with requisite approval from the CEO should be given to HR for Registration procedure.
- In cases where HR recommends the necessary training, approval is sought from the CEO for availability of time and resources.
- Employees will undertake the training that will be reimbursed by the company after one

year from the completion of the training.

• Following the external training, employees should share the learning with their team members on a formal level.

• Employees should submit a copy of the training completion / certification / participation document to HR on return.

XIX. PERFORMANCE MANAGEMENT SYSTEM

    i. Performance Management process:

a) To provide a framework for systematic planning of performance objectives at the beginning of the year.

b) To ensure Congruence between individual objectives & organizational goals.

c) To identify the gaps in performance for the purpose of development.

The appraisal year is defined as the calendar year i.e., January to December.

The process commences with a performance planning/goal setting exercise in which the Key Result Areas for all individuals are defined at every 6 months through a discussion. The onus to set the Key Result Areas (KRAs) for all the employees and the feedback collected by all the employees should be submitted to the competent authority.

Time lines:

The performance review has to be done every half yearly (i.e.in July and December); at the end of the calendar year all the ratings are to be collated which helps in arriving at an annual rating for the individual.

▪ At the end of the 6 months the employee has to fill in his achievements against the agreed KRAs. He/She also needs to allocate a score to the achievement based on the rating sheet below:

1	2	3	4	5
Outstanding	Exceeds Expectations	Meets Expectations	Needs Improvement	Below Expectations

- Appraisal discussion with CEO on the basis of employee-to-employee feedback in the feedback form.

- The CEO can alter the ratings / weights if he/she deems it fit.

- The CEO will then identify areas for improvement for the employee based on the discussion which have to be documented in the form.

- Once there is consensus on the rating the form has to be signed by the employee and the CEO. (The employee can take a copy of the signed form for his records).

- Once all ratings have been collated by HR there has to be a normalization discussion. The participants for this discussion would be all the business heads, CEO, HR. The primary motive of the normalization process is to ensure that the ratings are following a normal distribution.

- Peer evaluation (Employee Evaluation & Feedback Form) will also be an important factor in appraisal process.

**Annual increment based on the evaluation & performance is up to 20% & percentage may vary under special cases.

XX. COMPENSATION

- Compensation in iHUB DivyaSampark is based on performance.

- Compensation will be reviewed annually in December; in exceptional cases, it can be half yearly.

- In addition to taking home salary, awards will also form part of the compensation.

- At entry levels, salaries of new entrants are based on qualifications and market situation. Once in the organization, increments will be based on performance.

- All employees are covered by the Provident Fund, as per the Act. Salaries and perks vary according to the levels held by the members.

XXI.   EMPLOYEE RECOGNITION POLICY

Objective: To build a culture, where due appreciation and recognition is given to deserving employees.

i. ON THE SPOT RECOGNITION

This type of a recognition, can be given for any deserving performance or stupendous success or achievement.

Such a quick recognition can be given for any good work, for which there can be no delay in applause or appreciation.

Procedure:

a) A special space would be kept reserved for this on the notice board and can put up an appreciation note with immediate effect on the notice board.

b) Along with this a public announcement in front of all the employees at the office, would add to the esteem of the employee.

ii. WEDDING GIFT

Confirmed Employees who get married during their employment may be gifted with a Complimentary gift or Cash by the Company.

iii. COMPANY EVENTS

To appreciate and get together for special occasions and celebrate within the organization

Events that are marked as Special:

➢ Divyasampark FAMILY DAY

iHUB DivyaSampark Day can be celebrated with all the employees on the day iHUB

DivyaSampark was registered i.e., 20th October. A lunch hosted by the company followed

by an entertainment session will be the agenda for the celebration.

➢ ANNUAL PICNIC

To encourage bonding among employees, an annual picnic on a pre-decided date, will be

organized. Such a picnic would be to a place where a one-day return trip is possible.

➢ DIWALI GET TOGETHER

On the occasion of Diwali, the company sponsors a small get together for snacks and

coffee along with customary sweet and gifts distribution practice.

➢ BIRTHDAY CELEBRATIONS

The special occasion of celebrating employee birthdays will be done on the same day. A

cake cutting ceremony is held to celebrate all birthdays.

The admin / any other colleague can arrange a cake and a bouquet for the birthday

celebration in the office for the employee. The admin or the employees who has organized

the event can raise a claim up to a maximum of Rs. 1000/-.

➢ TEAM BUILDING ACTIVITY

For team building we can go at some outside location at company expense.

1.0 Grade Structure

The grade structure applicable to all employees on rolls of the company is as follows:

Level	Designation

Senior Level	CEO
	Vice President/Chief Technical Officer /Chief Operating Officer/Chief Investment Officer

Mid-Level	Assistant Vice President
	Senior Manager/Technical Manager
	Manager/Technical Manager
Junior Level	Assistant Manager/Assistant Technical Manager
	Associate/Technical Associate
	Support Staff

PURCHASE POLICY

In the context of changing economic and business scenario, introduction of the General Financial Rule, 2017 (GER, 2017), GST, use of online services, digital India mission, transparent and efficient, it is imperative to formulate the rules and regulations for purchase and stores. As a matter of policy DIVYASAMPARK IIT ROORKEE encourages the adoption of established procedure, wide publicity, fair competition and efficient delivery of the desired objectives for which the purchases/ orders are made in the company.

DIVYASAMPARK, being primarily a research supporting and funding Hub, the requirements are scientific with limited vendors. The procurement is time as well as project specific.

The purchaser shall make reasonable efforts to draw precise and accurate specifications of products/ works and find out the details of possible bidders for purchases.

1. Approval of items and funds

Items and funds for purchase may be approved by the Competent Authority as defined below:

Competent Authority:

    i   For purchase/ orders up to ₹ 1 Lakhs is CEO/ Vertical Head (VH).

    ii   The online purchase up to ₹ 2 lakh from source within India is CEO/ VH.

    iii   For purchases from ₹ 1-5 Lakhs is the CEO.

    iv   For purchases more than ₹ 5 - ₹ 50 lakhs are the CEO + Project Director is required.

    v   For the purchase above ₹ 50 Lakhs the CEO + Project Director + Chairman, Board of Director.

vi   For purchases made by local purchase committee (LPC) up to ₹ 5 lakhs recommended by the Indentor and approved by CEO and above ₹ 5 lakhs to ₹ 10 lakhs recommended by Indentor and approved by CEO + Project Director.

vii   The annual maintenance/ service contract from the original equipment/ machines/ ACS manufacturer/ manufacturer's authorized supplier, for a value of maximum of 10% of the original cost for the first 2 years and thereafter 15% of the original cost or 110% of previous year AMC value, whichever is lower by CEO.

viii The repair work, spare parts, calibration from the original equipment manufacturer/ manufacturer's authorized supplier, calibration from NABL accredited laboratory, by CEO.

Purchase Committees

i   DIVYASAMPARK shall make any purchase costing above ₹ 100,000/- except online purchases (Section 2, Point ii) and purchases for which an LPC (Section 2, Point v) has been constituted.

ii   All the purchases shall be made as per the Purchase Rules of DIVYASAMPARK. The following committees are proposed to simplify the purchase process:

   a   Purchase Committee (PC) for purchases upto ₹ 25 Lakhs, with one Indentor, one vertical Head, one financial authority and CEO. The term of PC shall be the duration of the project.

   b   Major Purchase Committee (MPC) for purchases upto ₹ 50 Lakhs, with one indentor+ CEO+ VH+ Financial Officer in charge + Project Director.

   c   Special Purchase Committee for Purchases above ₹ 50 Lakhs with Chairman,

BoD or his nominee + CEO + Project Director + VH+ Finance Officer + Indentor

d   Local Purchase committee (LPC) will be constituted by Divyasampark/ PI, having three members, after approval by CEO for making purchases which are urgent in nature or job/ fabrication works for the completion of installation.

Types of purchase

i   Purchase upto ₹ 1 Lakh may be made without calling quotations.

ii   <u>Online purchases</u> upto ₹ 2 lakh if the source of supply is within India.

iii   All purchases above ₹ 1 Lakh should invariably be made by the Divyasampark through inviting quotations as well as website publication except on line purchases at point ii above which may be made by the indenter and LPC at point vi of Section **2.** However, in case of single source purchases (other than proprietary items), website publication is not required.

iv   <u>Limited Tender:</u> For purchases from ₹ 1 Lakh to ₹ 15 lakhs, Divyasampark will send Enquiry Letters under Limited Tender to minimum 5 potential vendors identified by the indenter/ PC.

v   <u>Limited Tender:</u> For purchases between ₹ 15 Lakhs and ₹ 50 Lakhs Divyasampark will send Enquiry Letters under Limited Tender to minimum potential vendors identified by the indenter/PC. In case potential vendors are less than 6, Divyasampark can opt for open tender. However, for purchases above ₹ 30 Lakhs, the enquiry letters shall also be placed on GoI website (eprocure.gov.in).

vi   <u>Open Tender:</u> Where the total cost of purchase is estimated above Rs. 50,00,000; tenders will be invariably be invited through publication of tender notice in e-publication on GOI website (eprocure.gov.in) and tendering may be through e-

procurement.

vii <u>Single Tender:</u> Purchase upto ₹ 30 lakhs can be done by sending an Enquiry letter to a single firm under the following circumstances:

   a. It is in the knowledge of the user department that only a particular firm is the manufacturer/ supplier of the required goods or is proprietary item(s).

   b. The required goods are to be purchased from a particular source and the reason for such decision is to be recorded in the form of PC Report.

   c. For standardization of machinery or spare parts to be compatible to the existing sets of equipment, the required item is to be purchased only from a selected firm.

   d. The notice regarding the purchase of item(s) of propriety in nature must be uploaded on Divyasampark's Website giving a minimum time of 7 days (excluding National Holidays) to submit quotation. However, in other cases of single source purchases e.g. a compatible spare part from manufacturer of the equipment, order can directly be placed without publishing the requirements on the website.

   e. Many times, it is found that the certain items which carries some critical technologies are solely manufactured by some foreign companies who may not have any Indian counterpart/ representative/ dealer. In such cases, it becomes extremely difficulty to purchase these specialized/ customized items carrying critical technology which might be essentially desired to meet the objectives of research endeavours. In such cases, the notice regarding purchase of item(s) must be first uploaded on Divyasampark's website giving a minimum time of 7 days (excluding National Holidays) to submit

quotations. In case there is no response, quotations may be collected through e-mail, with a clause that the proof of email communication with at least three

relevant companies should be given by the indenter. Further, even if only one of the foreign manufacturers responds against the email enquiry, then it should be considered as the valid quote to place the PO.

Orders on nomination basis:

If the purchase is proposed from the Central/ State Government or Central/ State Public Sector Undertaking/ Organization/ Company, the competent authority may approve proposal on the recommendations of concerned PC and CEO for purchase up to ₹ 1.5 Crore, without inviting any type of tender as per terms and conditions of the Government/ Public Sector Undertaking/ Organization as the case may be. Certified Fabrication, Foundaries, special type of scientific equipments/services which are not available in India. The purchase upto ₹ 1.5 crores can be made on nomination basis after signing an appropriate MoU/Agreement approved by Chairman BoD.

Government e-Market place (GeM):

Government of India recently initiated online Government e-Marketplace (GeM) for common use Goods and Services. The GeM portal may be utilized by Divyasampark for direct on-line purchases as under:

a) Up to ₹ 100,000/- through any of the available suppliers on the GeM, meeting the requisite quality, specifications and delivery period.

b) Above ₹ 100,000/- and up to 30,00,000 through the GeM seller having lowest price amongst the available sellers, of at least three different manufacturers, on GeM, meeting the requisite quality, specifications and delivery period.

Above 30,00,000 through the supplier having lowest price meeting the requisite quality, specifications and delivery period after mandatorily obtaining bids, using online bidding or reverse auction tool provided on GeM.

Expression of Interest (EOI):

In case, there is unawareness or not enough clarity about the specifications of the intended purchase/ services/ orders for an estimated amount of Rs. 50 lakhs and above and their possible bidders, the method of inviting "expression of interest" and also known as "two stage bidding" may be adopted through open tender process and after receiving the details, the specifications may be finalized and offers be obtained as limited tender from the eligible vendors.

Enquiry for seeking EOI should include in brief, the broad scope of the work or service, inputs to be provided, eligibility and the prequalification criteria to be met by the bidders and their past experience in similar work/ service. The bidders may also be asked to send their comments on the scope and specifications of the works or services projected in the enquiry. Adequate time should be allowed for getting responses from interested bidders.

On the basis of the responses received from the interested parties, bidders meeting the requirements should be short listed for further consideration. However, in special cases if there are less than three bidders an EOI can be send again. Based on the inputs received from the shortlisted bidders, detailed specifications/ terms of reference/ general and special conditions/ formats shall be drawn to seek two-part bids as technical and financial proposals only from shortlisted bidders. If it is appropriate a pre-bid meeting may also be scheduled where the suggestions from prospective bidders on the issued document be discussed and amended if necessary. Amendments, if any, need to be shared with all short-listed bidders in writing before the bid submission.

Rate Contract:

If the purchase is proposed on the basis of rate contract approved by Central Government Company, or on rate Contract approved by TIH/IITs/GeM/DGS&D, orders for purchase upto Rs. 25 Lakhs, may be approved by the competent authority, without inviting any type of tender as per terms and conditions of the Government/ Public Sector Undertaking/ Organization as the case may be.

Purchase through LPC:

Purchase of goods, in case of urgency/ to complete installations/running experiments/ chemicals/ some specific needs of time-bound research projects (e.g. electronic components, capacitors, inductors, etc.)/ machine parts/ liveries or sundry items etc. duly recorded, on each occasion may be made on the recommendations of a duly constituted LPC. At least three quotations (by email or fax or collected personally in a cover) be obtained by LPC. The committee will survey the market to ascertain the reasonableness of rate, quality and specifications and identify the appropriate suppliers. Roorkee being the small town, nearby cities like Haridwar, Dehradun, and Delhi etc and from Industry Hubs such as Bangalore, Hyderabad, /Chennai, etc are also covered for such purchase. In specific cases other places in India or abroad may be considered for such purchases.

The benefit of warranty and other clauses as available must be availed.

The committee may also make purchase by taking advance. However, purchase in such case should invariably be made by placing order by the concerned indenter.

Special Purchase Committee (SPC): Purchase of any special kind or need duly recorded may be processed through a SPC.

Tender notices must also be displayed on the Divyasampark website. Those downloading the tender document from the website should deposit tender fee, if any, while submitting their

quotation/ tender. Earnest money deposit (EMD) should also be submitted along with the quotation/ tender, only if PC decides to do so.

Only those quotations which are received within the due date and time, specified in the enquiry letter/ tender notice, will be considered

Black listing of a firm can be done by Divyasampark on the basis of recommendation of PC, advice from legal cell and with the approval of the Competent Authority.

The firms for the purpose of inviting quotations for purchase of materials/ services/ equipment/ instrument etc. will be manufactures or authorized dealer/ agents/ stockiest/ suppliers/ service providers or firms undertaking job works.

Procedure for Inviting Quotations:

The following procedure should be observed for inviting quotations/ tenders:

a   The Indentor will prepare the specifications of the required item and also, prepare the list of suppliers. However, Divyasampark/PC can also identify venders in addition to the list provided.

b   In the indent, the Indentor should duly mention the quantity of proposed item, copy of the approval of funds (with allotted grant code) for the required item, complete specifications as well as requirements of warranty, training/ technical support, after sales service, AMC, packing etc. The indent should be submitted to Divyasampark along with the hard and soft copies of the addresses of the likely suppliers and precise and accurate specifications.

c   Dvyasampark will examine the indent/ documents as per approved project and put it infront of PC for its approval. Divyasampark will then initiate the purchase process by

inviting quotations

    i   <u>Single-bid system:</u> For purchases with estimated cost of up to ₹ 30 lakhs under single bid system (technical and financial bid together and opened at single instance). Bids will be opened by Divyasampark in the presence of bidders and indenter if they so desire. Techno-commercial comparative statement will be prepared by Divyasampark and put it infront of PC for approval.

    ii <u>Two-bid system:</u> For purchase with estimated cost of more than ₹ 30 lakhs two bid system (Part A: Technical Bid and Part B: Financial Bid in separate sealed envelopes to be opened at different instances) shall be followed. Technical bid will be opened by Divyasampark in the presence of bidders and indenter if they so desire. Technical comparative statement will be prepared by the Indentor/ PI. If required, the concerned PI/ indenter may obtain clarification/ document from bidders at the time of technical evaluation regarding any technical aspect(s) as per the enquiry letter/ tender document.

d In case of inviting quotations by sending enquiry letters (under Limited Tender), a minimum period of 7 days' notice should be given.

e In case of inviting tenders through Divyasampark website, a minimum period of 7 days' notice (after publication of the tender) should be given and minimum 2 weeks in case of Global Tender. In the enquiry letter the firm may be asked to enclose copies of the last two supply orders for the same item as a justification for reasonability of rates.

f In case of purchase of special/ sophisticated equipment, costing above ₹ 30 lakhs, a performance bank guarantee or Bank Draft or FDR pledged in favor of CEO, Divyasampark iHub Roorkee For Devices Materials and Technology Foundation, for an

amount equal to or more than 5% of the cost price for the duration of the warranty period

plus sixty days will be taken from the supplier/ Indian Agent. However, PC can waive off this obligation under special cases where reputed OEM is present.

g   A fixed amount as Earnest Money Deposit (EMD in the form of Bank Guarantee or Bank Draft or FDR pledged in favour of CEO, Divyasampark iHub Roorkee For Devices Materials and Technology Foundation, should be demanded from the firms and should be mentioned against specification of each item/equipment whose estimated cost is above ₹ 30 lakhs. The amount of EMD, Valid 45 days beyond the validity period of bid, will be determined at the time of inviting quotations/ tenders, by Divyasampark on case to case basis, which will not be less than 2% of the estimated cost of the purchase. However, PC may waive off the EMD for higher amount purchase and in case of reputed OEM & MSME.

h   All the terms, conditions, stipulations and information to be incorporated in the bidding document are as per IIT Roorkee.

Approximate quantities may also be mentioned and the firms should be asked to give samples along with the quotations/ tenders, wherever possible/ necessary. The descriptive literature, if available, should be enclosed with the quotations/ tenders.

If the estimated cost of equipment is more than ₹ 25 lakhs, tender bids shall preferably include AMC for a period of minimum three years. This is based on PC recommendation.

The tenders and quotations can be accepted in email. However, bidders may also send the same by couriers, speed post or equivalent.

Procedure for Opening Quotations:

Preferably the GST number should be given on the quotation of each firm; however, this will not be mandatory. In case any change towards GST or other statutory levy is claimed by the firm, the registration number for the same should be available on the bill/ invoice.

In case of purchase of an item under single tender enquiry, the quotations through e-mail/fax from the manufacturer may also be considered. But the proof of e-mail requesting the rate of the propriety item must be placed in the purchase file.

In case of two bid system, the Financial Bids will be opened after Tech Bids are approved by the PC, on the due date and time by Divyasampark in the presence of the indenter and the technically qualified vendors, if they so desire. The date of opening the Financial Bid will be informed to the technically qualified bidders and the indenter well in advance. The Financial Comparative Statement will be prepared by Divyasampark and sent to Indentor/PC for vetting & CEO for signature and approval.

Procedure for Processing the Purchase Cases

In case of purchase with estimated cost of more than ₹ 1 Lakh and upto ₹ 15 Lakhs, less than three valid quotations can be considered for opening of bids as well as further processing of the purchase case. However, the concerned PC have to certify the price reasonability with appropriate justification.

In case of purchase with estimated cost of more than ₹ 15 Lakhs minimum three valid quotations are required. If the number of quotations received against an enquiry letter/ tender notice is less than three, quotations have to be re-invited by Divyasampark after the specific recommendation of indenter to do so. Any other approval is not required. However, if the number of quotations received is still less than three after retendering, Divyasampark should process the purchase on the basis of these quotations with specific justification by the concerned PC.

If the number of quotations/ bids received against open tendering (through newspaper) is less than three, the purchase case can also be processed with specific justification by the concerned PI/ Indenter.

Negotiation normally may not be held. However, whenever necessary may be held with the lowest bidder only with the approval of competent authority.

Processing the Purchase and Placing the Orders by the Divyasampark

Divyasampark will prepare and submit the purchase proposals in the prescribed format and will get it vetted from the Indenter. Then the case will be forwarded to the Internal Audit Section for pre-audit. After preaudit the case will be forwarded to competent authority/ approving authority for approval. However, purchase cases below ₹ 15 lakhs need not be pre-audited by Internal Audit Section.

The purchase order will be prepared by Divyasampark on the basis of the duly approved Purchase Proposal.

The Purchase Order will be sent to the eligible firm on its address by post/ mail by Divyasampark. A copy of the Purchase Order will be sent to the concerned Indenter/ PI for information.

In case of import, the copy of the Purchase Order will be sent to the Clearing Agent. Divyasampark will take necessary action about the advance to be sent to the Clearing Agent for clearing goods from the customs office to avoid demurrage and sending the same to the concerned Indentor.

On receipt of written request/ necessary documents from the firm/ clearing agent, the Divyasampark will process the file for issue of all types of certificates e.g. Customs Duty

Exemption/ Excise Duty Exemption/ Trade Tax Declaration etc., under the signature of the CEO of Divyasampark.

No formal order is required to be placed for purchases upto ₹ 1 Lakh and online purchases as mentioned in section 2 point ii.

Repeat order:

Repeat purchase order may be placed by the Divyasampark subject to the following conditions:

a   Within a period of 120 days of placing the original order or 45 days of receiving supplies against the original order, whichever is later.

b   With no change in rates as well as terms and conditions of supply.

c   For purchases on the basis of limited/ open tender inviting quotations but not through LPC.

d   Divyasampark will not place more than five repeat orders and the amount or number of items shall not exceed that of the original order.

e   No repeat order will be placed if buy-back is involved in the purchase.

Goods Receipt and Processing of Bill:

a. On receipt of goods by the concerned Indenter as per Purchase Order along with packing slip, bills in duplicate / triplicate etc., necessary entries will be made by Divyasampark and VH for each unit in the stock register. The bill for payment along with necessary documents, installation certificate etc. will then be sent by the indenting department to Divyasampark for necessary checking and forwarding to the Finance & Accounts Section of Divyasampark for payment.

b. In ease of short supply/ any damage / supply is not found as per Purchase Order, the indentor/ VH will inform in writing to CEO, Divyasampark who will request the firm to rectify it within a suitable time otherwise the matter will be referred to Legal Cell for further necessary action.

Payment Term:

a. In purchase generally, the payment is after delivery and installation (Wherever installation is required).

b. For the purchases having FOR/ destination, 100% payment on receipt and acceptance of goods/ service by the indenter subject to production of relevant documents.

c. For the purchases having FOR/ destination and involving installation and commissioning by the supplier, 80 % payment on receipt and acceptance of goods/ service by the indenter and balance 20 % on successful installation and commissioning by the supplier and acceptance by indenter.

d. Advance payments to supplier: Ordinarily, payments for supplies/ services should be released only after the services have been rendered or supplies made. However, it may become necessary to make advance payments in the following types of cases:

   i   Advance payment demanded by firms for supplying equipment/ services etc., up to 100% advance amount against 110 % Bank Guarantee may be allowed.

   ii Advance payment demanded by firms holding maintenance contracts for servicing of air-conditioners, computers, other costly equipment/ construction etc. against fabrication contracts, turnkey contracts etc. Such advance payments should not exceed the following limits:

   • Thirty percent of the contract value to private firms.

- Forty percent of the contract value to a State or Central Government agency or a Public Sector Undertaking;

iii In case of maintenance contract, the amount should not exceed the amount payable for six months under the contract.

iv Competent authority may relax the ceilings (including percentage laid down for advance payment for private firms) mentioned above.

v While making any advance payment as above, adequate safeguards in the form of bank guarantee etc. should be obtained from the firm as per point (i) above.

vi 100% advance payment without any bank guarantee in case of software, licenses, fabrication & specific instruments with the approval of competent authority on the recommendation of PC and CEO Divyasampark in case of reputed firms only.

vii Payment of demurrage: Upto 20,000/- may be approved by Indentor/PI. For higher amounts approval of the competent authority is required.

e. However, Government firms or public sector undertakings may be exempted from providing the bank guarantee. But for public limited firms having an annual turnover of Rs.500 crores or more the requirement of bank guarantee may be waived-off by the competent authority if the payment involved is upto Rs. 25 lakhs.

f. Any additional payment in the Bill/ Invoice on account of revision of taxes/ duties may be considered by Divyasampark, provided it is as per the terms and conditions of purchase order.

g. Payment to Foreign Supplier:

i All Letters of Credit will be opened by Divyasampark against the purchase orders and grant (plan/ project/ miscellaneous) allocated to the concerned PI.

ii   Payment can also be made by sight draft/ Bank Transfer/ Wire Transfer after receipt of material in good condition.

h. Payments to Govt./ Public Sector Undertaking/ Organization: The terms of payment to the Govt./ Public Sector Undertakings/ Organizations/ Company will be as per the terms and conditions given by them in their quotation/ proforma invoice/ rate list/ rate contract. 100% advance can be made to such organizations along with the order if it is in the terms and conditions of the said organization.

General Rules:

a. Liquidated Damage (Late Delivery): There should be a suitable provision in the terms and conditions of a contract/ purchase order for claiming liquidated damages of appropriate amount from the supplier to take care of delays in supplies and performance, for which the supplier is responsible.

b. A penalty of 0.5% of the delivered price of the delayed goods for each week subject to a maximum of 5% (five percent) of the delivered price is to be incorporated in the terms and conditions of the purchase order. Delivery period shall include supply of the item in good condition and satisfactory installation. Any request for extension of time by vender (with specific reasons) should be carefully reviewed and approved by PC. No approval is required for extension of time from competent authority. Any delay in fulfillment of the requirements for paying the bills shall be counted under penalty clause. Divyasampark will pass bills for payment only after receipt of report of the concerned PI/Indentor regarding supply in good condition, satisfactory installation and performance by the firm as per the terms and conditions of the purchase order.

c. The "buy-back" for purchase through quotation/ tender or through rate contract for supply of equipment and systems including personal computers, refrigerators, air-conditioners, photocopy machines, data projector etc. is admissible. While inviting quotations/ tenders or proposal for rate contract, the supplier/ vendor will be asked to quote rates and other terms for 'buy-back' of existing equipment/ systems. However, the following conditions shall apply:

1. In case of computers, system should be at least three years old.

2. In case of photo-copier machines, a machine should be at least seven years old or five lakhs of copies should have been generated on the old machine.

3. In case of refrigerators and air-conditioners, they should be at least seven years old.

4. Un-serviceable/ beyond repair items

5. Cost of operation and maintenance is high

d. The points, which are not covered by the purchase rules of Divyasampark, will be as per the GFR of the Government of India.

e. Any matter not covered by these rules and GFR may be referred to the Board of Directors.

f. These rules may be revised as and when required with the approval of HGB.

12.2 STORE RULES

1. Classification of Stores:

   All stores procured shall be classified into following three categories;

   A. Major Asset (MAS)

   B. Minor Asset (MIA)

   C. Consumable Stores (CS)

A. Major Assets (MAS): Stores satisfying any one of the following conditions shall be classified as major Assets

    i. Store which are intended to be used over prolonged periods before becoming unusable and obsolete.

    ii. Any item which is classified as Major Assets (MAS) by the standing committee (as given in note below) constituted for this purpose.

Examples: Lab Equipment, Assembled Instruments, Brass Ware Flower Pots, Lamp Stand etc), Fabricated Instruments, Gas Cylinders, Almirahs Steel, Main frame computers 'servers, Work Stations, Motors, Networking Devices, Photo copying machines, Plants Printers, Multimedia Projectors, Welding machine, Workshop heavy equipment (Lathe Machines drilling & milling machines, power saw, wood working machines) etc.

B. Minor Assets (MIA) or Limited Life Time Assets (LLTA):

Stores may be classified as Minor Assets or "Limited Life Time Assets" for the items with a life of 4-5 years.

Examples: All Lab Equipment, (Power supplies, CVTs/CRO etc), type writers, accessories and audio-visual systems, All room fixtures (door closers, blinds, boards, wall/ exhaust fan etc), UPS, Wooden

and Steel Furniture (chairs, tables, racks, trolleys cabinet etc), Battery chargers, Computer

Accessories, Cryogenic containers, Cyclostyling machines, Fume Hoods, Modern Hub (Routers)

switches, Personal Computers, Portable Generators, inkjet/ laser printer Small portable electrical hand

tools (Hand drill, planners, grinders etc), Software, Telephone sets including mobile phones,

Vacuum cleaners, desktop, palmtop calculators, etc.

C. Consumable Stores (CS):

Stores satisfying any of the following conditions shall be classified as Consumable

Stores

i. Stores which exhaust with lapse of time.

ii. Stores which are rendered unserviceable due to normal wear and tear.

iii. Stores which have negligible disposal value.

Examples : Chargeable and non-chargeable batteries, Chemicals & plastic material,

Components installed inside Cabinet of PC (motherboard, RAM, ports, Hard Disk,

DVD, PCI cards etc), Electrical items like plugs, tops, switches, fixtures, heater

plates etc, Electronic Component like resisters, ICs, LED's, Transistors, Diodes,

transformers, soldering iron and solder etc), fabrication materials like Metal sheets,

rod wires, Glass, Hand Tools (screw drivers, pliers, scissors, tools related to

gardening and other tools etc), plant pots, Light sources (bulbs, tubes, laser pointers

etc), Optical components like Lenses, Prism, Gratings, filters, optical fibers, patch

cord etc, printer consumables (Ribbon, Cartridges etc), Stationery items (papers,

cutters, staplers, pens, pencils, alpines, u-clips, sharpeners, dispensers, pen stands,

CD covers etc), tubing (copper, Aluminium, rubber, PVC etc), umbrellas &

raincoats, W/shop cutting tools (Bits, hacksaws, blades, drill bits, oil & coolants,

files etc), Capacitors, CD ROMs, CDs, Conductivity bridge, Connectors, Curtains, Darri/Carpets & other cloth items, Electric wires / UT P Cables [Optical Fibers, Electrodes, Floppies/pen drives, Handheld water sprayer/sprinkler, Heating mantles, Iron meter, Keyboard, mouse and speakers, Lab. Apparels (shoes, lab coats, goggles, aprons, gloves etc), Magnetic tape, Medicines, Non electrical balance, pH meters, Plastic buckets, Room Heaters and Blowers, Shakers, Small Measuring components and instruments (current/volt/Ohm meters costing less than Rs. 10,000/-), Stirrer, Table covers, Thermostat, Torch, Water bath, Water distillation glass units, Water distillation stills etc.

NOTE: The competent Authority may constitute a standing committee to resolve any confusion in classifying the assets not covered above.

2. General Rules:

   i.   Stock Registers for all Major Assets, Minor Assets and consumable items, for each Project shall be maintained separately and kept with the concerned PI. But all the assets shall also be entered simultaneously in the Divyasampark T&P register.

   ii. Stock Registers for Assets and Consumables purchased under project shall be maintained separately by the concerned PI and at the closure of the project the items, assets and consumables have to be transferred to the stock register of Divyasampark.

   iii. Details of the assets shall simultaneously be intimated to Divyasampark by the different PIs as and when purchase is made by them.

3. **Store Verification:** The annual of all major and minor assets of projects shall be done by verifying Officer appointed by CEO, Divyasampark. On recommendations of the PI/concerned head regarding the irrecoverable losses, and losses due to stores lost, or rendered unserviceable due to fair wear and tear the CEO will constitute the committees for survey of unserviceable (Major & Minor Assets) stores in their respective department. This committee shall inspect such losses and fix their depreciated value. It will also pin-point responsibility for losses of items found short and shall recommend as to how these are to be made up/paid for by the individuals responsible for the loss. The report of the committee shall be considered by the Divyasampark and its recommendations in respect of major assets shall be sent to the BoD on prescribed Proformas, for consideration by CEO.

4. Writing off and disposal of Unserviceable Stores

    a. On the recommendation of PI, CEO may allow writing off the minor assets with intimation to the BoD.

    b. The CEO shall appoint a Technical Committee which shall examine the proformas sent by the PIs and shall recommend the Major Asset stores which are actually unserviceable beyond economic repair/beyond local repair, to be considered for writing off, by the Competent authority. The Technical Committee may delete those items which in its opinion, are serviceable or are not beyond local/economic repair. The composition of the Technical Committee shall be as under:

        i. Two BoD nominee for two years, who shall be the Chairman,

        ii. One member nominated by CEO for a period of two years.

c. The recommendations of the Technical Committee (TC) are to be considered by the Competent Authority (CA) to write off as under:

Competent Authority	Normal Wear & tear, Individual Item Costing (Rs.)	Abnormal Wear & Tear, Individual Item costing (Rs.)
PI	NIL	NIL
CEO	Upto 15000	upto 200000
Board of Director	Upto 2000000	Any Amount

After approval of the Competent Authority, a proper notification for writing off is to be issued by the CEO.

5. Disposal Committee:

The stores, written off, will be inspected and auctioned by the Disposal Committee (DC). The committee shall consist of the following members.

i. Two nominees of the Board of Director, who shall be the Chairman for a period of Two years.

ii. Member Secretary appointed by the Competent Authority for a period of Two years

Items are required to be disposed in line with guidelines/rules of GOI, for Hazardous and Non-Hazardous Items.

NOTE:

The rules may be revised as and when required.

INTELLECTUAL PROPERTY RIGHTS

Intellectual property plays an important role in providing a competitive edge to an organization. The intangible assets of an organization - such as know- how, inventions, brands, designs and other creative and innovative products - are, today, often more valuable than its physical assets. Keeping this in mind, this Intellectual Property Rights Policy Document (hereinafter referred to as the Policy) of the iHUB DivyaSampark (hereinafter referred to as the hub) seeks to provide guidance to all the stakeholders on the practices and the rules of the hub. In regarding intellectual property rights (IPR) and obligations which include the nature of intellectual property (IP), its ownership, exploitation, technology transfer and confidentiality requirements. The policy laid down in this document is expected to fulfil the commitment of the hub to promote freedom and provide a conducive environment for technology development in CPS.

PURPOSE AND OBJECTIVES

iHUB DivyaSampark has formulated this Policy for the management of intellectual property right to:

a) Provide a conducive environment leading to development of intellectual property;

b) Facilitate, encourage, promote and safeguard innovation and product development;

c) Enable the hub to make beneficial use of such developed IP for the maximum possible benefit of the creators, the hub, and the nation at large.

d) To provide a comprehensive single window reference system for all intellectual property rights issues relating to intellectual property generated at iHUB DivyaSampark;

e) To safeguard the interest of creator/innovator of intellectual property and provide fair distribution of returns accruing from the commercialization of IPR;

Other than the clauses included in the tripartite agreement between Mission, HI and the hub, following policies shall be applicable:

(a)   All IP should be owned by Hub if the project is funded by the hub.

(b)   To incentivize industry partner in the projects where the partially funded by industry partner, the revenue share of any benefits accrued from licensing or sale of such IP will be shared. If industry is contributing X% of the total funded cost in cash, following revenue share will be applicable:

   (a) iHUB DivyaSampark: $30\% - (X/2)$ %

   (b) Creator/Innovator: $70\% - (X/2)$ %

   (c) Other Entity (Industry): X%

   For example, if industry is contributing 10% in cash, then hub will get 25%, PI will get 65% and industry 10% of revenue generated.

(c)   IP generated by projects funded solely by Hub, shall be owned by the Hub, the revenue share of any benefits accrued from licensing or sale of such IP will be shared as per follows:

   (a) iHUB DivyaSampark: 30%

   (b) Creator/Innovator: 70% **

**If the innovator/creator is an employee of a startup, then the revenue sharing will go to the startup and not the individual.

(d)   Hub will have the exclusive right to commercialize (license, repackage or sell) the IP for the life of the IP right available.

(e)   Sponsored strategic research projects which fall into the roadmap decided by Hub by entities other than Hub will lead to joint ownership of IP. Hub will own exclusive rights to

commercialize the IP. Participating entities can get non-exclusive rights to IP usage on a business model.

(f)   Hub can also decide based on funding amount to give exclusive rights for IP which is time-bound to the Industry partners.

(g)   Hub will take responsibility for the entire life cycle of the IP generated by Hub funding covering the filing for protection via patents, copyrights or trademarks and finding suitable licensees.

(h)   In case of startup being formed out of the IP, License to IP and depending on the IP, there may be more than one startup formed then hub shouldn't favour one startup over other in access to IP. This along with ownership will be transferred to startup in lieu of equity, revenue or data sharing or a combination thereof. In case Industry partners are significantly participating in IP creation, they can be given participation rights in the startup being formed.

(i)   If the startup who is assigned IP gets closed before funding, IP ownership and IP rights goes back to Hub, which can further licence it out again.

(j)   Hub can create special IP licensing policy for pre-existing startups in case they are collaborating in Hub projects in lieu of data sharing for innovation and research.

In case Hub contributes significantly to IP creation along with pre-existing startup, it can take equity in lieu of transferring IP in exclusive fashion for a period of time. Existing/prior IP at IIT Roorkee, in areas of relevance to the Hub, can be licensed to Hub for further commercialization with a revenue-sharing agreement on a case to case basis on the exclusive model.

13. TIME FRAME

S.No.	Activities	0 – 12 months (Phase – I)	12 – 24 months (Phase – II)	24 – 36 months (Phase – III)	36 – 48 months (Phase – IV)	48 – 60 months (Phase – V)
1.	Establishment of Section 8 Company, Recruitment of CEO, Call for Proposals, Logo, website, setting up of Advisory committee and HGB, Reviewing of proposals, recruitment of Initial TIH Team, Revised DPR, allocation and release of first installment to research proposals after due process, TIH Team expansion					
2.	Review of projects every 6 months for next set of installments subjected to fulfilment of mentioned deliverables, call for proposal for new proposals in addition to old, Recruitment of chair professors and faculty fellows, design and development of technology/ products, skill development/ CPS					

3.	Design and development of technology/ products, Industry Collaboration, skill development/ CPS					
4.	Industry Collaboration, commercialization/ marketing, skill development/ CPS, Proof of concept					
5.	Achievement of Self Sustainability mode, Revenue generation based on royalty sharing, Commercialization					

14. COST BENEFIT ANALYSIS

The hub expects to recover from the products/outputs (both hardware & software) as licencing fees, developed by using the technologies discussed earlier. Another source of short-term revenue for the hub are various training programs, short term cources, reports and databases, we will be creating and we expect to raise from these over the first five years of its operations. Apart from this, Divyasampark will also hold equity in the spin-off companies based on the IP generated. Apart from the financial benefits captured here, we will focus on several products and technologies which will have significant societal benefits such as economic development, damage protection, saving lives and livelihood improvement of poor communities. Other economic benefits and social benefits such as the earnings of the manpower trained and its socio-economic value and impact of the advanced technologies on the evolution of the society and impact on the virtuous cycle of knowledge creation are not captured here.

15. RISK ANALYSIS

Divyasampark i-HUB Roorkee is committed to technology, market, and implementation risks at an early stage of technology development and commercialization. Divyasampark i-HUB Roorkee will manage the technology risk through a thorough evaluation of the projects during the selection phase and close monitoring of the selected projects regularly and by staging the funding i.e the regular funding to any project will be on the basis of performance of the project. If the project is not performing as per the expectations, the funding may be stopped with prior notice.

The implementation risk is managed by having the right mentors to guide the development,

creating links with the existing Technology Business Incubators (TBI), and creating a pool of highly talented manpower through various skill development programs. Divyasampark i-HUB Roorkee will also strive to ensure timely decision-making to minimize implementation delays.

Market risk is managed by establishing an ecosystem of industry partners and reviewing marketing strategies. Project management risk can be managed by maintaining a strong team and ethics. Furthermore, each unsuccessful project will provide Divyasampark i-HUB Roorkee and those involved in the project with an opportunity to learn and improve the support and management practices of the project. It is also important to note that collective learnings from successful and unsuccessful projects will help us build our knowledge base and enhance our overall success rate.

While these strategies do not eliminate the risk, they increase the odds of developing advanced solutions and creating direct and indirect social and economic impact envisioned under this proposal. Divyasampark i-HUB Roorkee will be developing cutting-edge technologies. Deployment of these solutions in the market will require compliance with existing and evolvingstandards and regulations. Any lack of clarity in the standards and regulations of these solutions in the market will also have a significant impact on the revenue generation potential of the project.

16. COLLABORATORS

National Collaborators

S.No.	Name	Designation	Affiliation
1	Alokesh Ghosh	Associate Director, Agri and Environmental Electronics Group	Centre for Development of Advanced Computing (C-DAC), Kolkata
2	Amitava Akuli	Joint Director, Agri and Environmental Electronics Group	Centre for Development of Advanced Computing (C-DAC), Kolkata
3	Aparna Akula	Sr. Scientist	Central Scientific Instruments Organisation, Chandigarh
4	Arun Jana	Principal Engineer, Agri and Environmental Electronics Group	Centre for Development of Advanced Computing (C-DAC), Kolkata
5	Ashish Gaurav	Sr. Scientist	Central Scientific Instruments Organisation, Chandigarh

6	Balwinder Singh	Joint Director & Head ACSD	Centre for Development of Advanced Computing,
			Mohali
7	Bijoy K. Das	Professor	Indian Institute of Technology Madras
8	Bilal Habib	Scientist E & Dept. Head	Wildlife Institute of India
9	Brijendra Singh	Professor	AIIMS Rishikesh
10	Debabrata Ghosh	Assistant Professor	Thapar Institute of Engineering and Technology, Patiala
11	Debarati Bhattacharjee	Professor	Terminal Ballistic Laboratory, DRDO Chandigarh
12	Desh Deepak Sharma	Associate Professor	M. J. P. Rohilkhand University, Bareilly
13	G S Shailesh Babu	Associate Professor	Dayalbagh Educational Institute
14	H K Sardana	Chief Scientist	Central Scientific Instruments Organization
15	Harpreet Singh	Project Associate	Centre for Development of Advanced Computing, Mohali

16	Hena Ray	Joint Director, Agri and Environmental Electronics Group	Centre for Development of Advanced Computing (C-DAC), Kolkata
17	Hitesh Pahuja	Project Engineer	Centre for Development of Advanced Computing, Mohali
18	Indar Kumar Sharawat	Professor	AIIMS Rishikesh
19	L P Joshi	General Manager	THDC India Limited
20	Manoj Kansal, Vagesh Shukla	AD (CE&T and RRA)	NPCIL
21	Maria Dsouza	HOD	Institute of Nuclear Medicine, Delhi
22	Milan Sen		Central Mine Planning and Design Institute, Ranchi
23	Mrinal Dutta		CSIR-National Physical Laboratory
24	Nabarun Bhattacharyya	Senior Director and Centre Head, Agri and Environmental Electronics Group	Centre for Development of Advanced Computing (C-DAC), Kolkata
25	Om Hari Gupta	Assistant Professor	NIT Jamshedpur

| 26 | Prateek Kumar Panda | Professor | AIIMS Rishikesh |
| 27 | Rajesh K R | Associate Director | CDAC Thiruvananthapuram |

| 28 | S. K. Panigrahi | Principal Scientist | CBRI, Roorkee |

Industry Collaborators

S. No.	Name	Nature of Business
1	Arrow Electronics Inc.	
2	Astra Microwave Product Limited	Design and Manufacturing of RF & Microwave components
3	Caritas Infra Consulting Pvt. Ltd., New Delhi	
4	CEA-LETI	International Industrial Partner
5	Central Training Institute	
6	CoreEL Technologies India Pvt Limited, Bangalore	
7	Eagle Photonics, Bengaluru	
8	Ecosense Sustainable Solutions Pvt. Ltd.	
9	Edutech India Pvt. Ltd., Chennai	
10	Heal-agnostic Innovations Private Limited	
11	Junckit Systems, Noida	

12	Keysight Technologies India Pvt. Ltd., Bangalore	
13	Mellanox Technologies	International Industrial Partner

14	Micelio Labs Private limited, Bengaluru, Karnataka	
15	Micron, Roorkee	Industrial Instrumentation
16	OPAL-RT, India	Research
17	Post Graduate Institute of Medical Education and Research, Chandigarh	
18	Power Grid Corporation of India	
19	Proficient Design LLC, USA	Semiconductor Chip Design, production and testing
20	Quadsun Solar Solutions	Technology Development and Manufacturer
21	Sainergy Fuel Cell India Private Ltd., Chennai	
22	Samsung R&D Institute, Noida	
23	Semi-Conductor Laboratory Mohali	
24	Sruhad Technologies Pvt. Ltd., Gujarat	
25	Statcon Energiaa Pvt. Ltd., Delhi	Manufacturing Power Electronics

26	TATA power solar systems Ltd., Bengaluru	
27	Tektronix India Pvt. Ltd. Bangalore	
28	Tetrahedron Manufacturing Services Pvt. Ltd., Haryana	Manufacturing and Automation
29	Tsilicon Design Inc., Bangalore	Semiconductor

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