GOVERNMENT OF KERALA

Abstract

Electronics and Information Technology Department- Kerala University of Digital Sciences, Innovation & Technology (KUDSIT)- Plan Schemes 2024-25- Centre of Excellence- Administrative Sanction accorded- Orders issued.

ELECTRONICS & INFORMATION TECHNOLOGY (B) DEPARTMENT

G.O.(Rt)No.170/2024/ITD Dated,Thiruvananthapuram, 09-08-2024

Read 1 Letter No.KUDSIT/F&A/237/2024-25 dated 09/04/2024 from the Registrar, KUDSIT.

2 Minutes of the Departmental Working Group Meeting held on 27.06.2024

ORDER

The Registrar, Kerala University of Digital Sciences, Innovation & Technology (KUDSIT) as per the letter read as 1st paper above, has submitted proposal for the plan scheme, Centre of Excellence implemented by the KUDSIT amounting to Rs.1500 Lakhs for placing before the Departmental Working Group. The Departmental Working Group meeting of Electronics & Information Technology Department held on 27.06.2024, considered the proposal and recommended to issue Administrative Sanction for the financial year 2024- 2025.

2. Government have examined the matter and are pleased to accept the recommendations of the Departmental Working Group meeting held on 27.06.2024. Accordingly, administrative sanction for Rs.1500 Lakhs is accorded for the implementation of the following plan scheme by KUDSIT for the financial year 2024-25, as detailed below. The detailed activity-wise statement, outcome of the projects, deliverables and the activities proposed for the current financial year are attached as Annexure to this G.O:-

Sl. No	Centres of Excellence Head of Account: 4859-02-004-93 (P)	Amount (in Lakh)
1	DUK Knowledge Centre- Library and Information Service	120
2	School of Computer Science and Engineering (SoCSE)	220
3	School of Digital Sciences (SoDS)	120
4	School of Digital Humanities and Liberal Arts (SoDiHLA)	100
5	School of Informatics (SoI)	120
6	School of Electronics System and Automation (SoE)	160
7	Kerala Blockchain Academy (KBA)	100
8	Centre for Digital Transformation and Innovation (CDTI)	100
9	Centre for Digital Transformation in Culture (C-DTC)	80
10	Centre for Intelligent Government	130
11	Kerala Security Audit and Assurance Centre (K-SAAC)	100
12	Centre for Excellence in Intelligent IoT	50
13	Centre for Electronics Design and Testing	50
14	Centre for Excellence in Social Engagement	50
Total		**1500.00**

Details of the project are as follows : -

Parameter	**Description**
Amount to be expended	1500 Lakhs
Outcome of the Project	The five schools of the University- School of Computer Science and Engineering, School of Electronics Systems and Automation, School of Informatics, School of Digital Sciences and School

	of Digital Humanities- will focus on development of high quality talent, research on issues of larger interest and to develop and implement solutions to hasten the pace of digital transformation.
Benefits to the public	Establishing R&D facilities at Digital University to catalyze technical advances to promote societal welfare and address systematically the unfulfilled needs.
Beneficiaries of the scheme	• Faculty & Research Scholars • Post Graduate Students under MTech. & Msc. • Other Research Communities
Deliverables	Establishment of Knowledge Centre at DUK Establishment of 26 research centres under five schools at DUK Establishment of 7 inter disciplinary centres at DUK

The above scheme shall be implemented adhering to the following conditions:

- Contract appointments shall be as per the existing rules.

- Expenditure shall be limited within the budget allocation.
- If manpower component is involved, before paying salary, Head of Institution should ensure that all those posts are continuing with the specific approval of Government.
- If appointment of new personnel or purchase of vehicles is involved, prior approval of Government should be taken.
- Fund release will be based on actual requirement and the fund released should not be parked in banks.

- Store purchase rules should be strictly adhered to.

- Tender/ e-tender and other stipulated formalities shall be followed wherever necessary.

- For Civil Works, CPWD rates shall be followed.

- For Civil Works CPWD rates shall be followed.

3. The Registrar, Kerala University of Digital Sciences, Innovation & Technology (KUDSIT) shall follow all the prescribed guidelines, rules, other formalities and procedures for implementation of the scheme. Proposals for release of funds should contain break up of expenditure, report on the component wise expenditure of funds released during the previous year and component wise Utilization Certificates in the prescribed proforma. Funds will not be released in case of any procedural laxity or violation.

(By order of the Governor)
DR RATHAN U KELKAR I A S
SECRETARY

To:
The Registrar, Kerala University of Digital Sciences, Innovation & Technology (KUDSIT).
Principal Accountant General (A&E) Kerala, Thiruvananthapuram
Principal Accountant General (G&SSA) Kerala, Thiruvananthapuram
Finance Department
Planning & Economic Affairs Department
Electronics & IT (C) Department
Information Officer(Web & New Media Division), I&PR Department
Stock File

Forwarded /By order
Signed by
Mahesh. R
Section Officer
Date: 09-08-2024 13:06:04

Scheme 1: Centre of Excellence

Sl No	Name of the Schemes	Head of Account	Budget Sanction (Lakhs)
I	Centres of Excellence	4859-02-004-93 (P)	1500
	Total		**1500**

Focusing on knowledge creation, dissemination and application, Digital University would play a significant role in an effective transformation and growth of the society at large. The five schools of the University- School of Computer Science and Engineering, School of Electronics Systems and Automation, School of Informatics, School of Digital Sciences and School of Digital Humanities- will focus on development of high quality talent, research on issues of larger interest and to develop and implement solutions to hasten the pace of digital transformation.

Sl No	Centres of Excellence H/A: 4859-02-004-93 (P)	In lakhs
1	DUK Knowledge Centre- Library and Information Service	120.00
2	School of Computer Science and Engineering (SoCSE)	220.00
3	School of Digital Sciences (SoDS)	120.00
4	School of Digital Humanities and Liberal Arts (SoDiHLA)	100.00
5	School of Informatics (SoI)	120.00
6	School of Electronics System and Automation (SoE)	160.00
7	Kerala Blockchain Academy (KBA)	100.00
8	Centre for Digital Transformation and Innovation (CDTI)	100.00
9	Centre for Digital Transformation in Culture (C-DTC)	80.00
10	Centre for Intelligent Government	130.00
11	Kerala Security Audit and Assurance Centre (K-SAAC)	100.00
12	Centre for Excellence in Intelligent IoT	50.00
13	Centre for Electronics Design and Testing	50.00
14	Centre for Excellence in Social Engagement	50.00
	Total	**1500.00**

Component No: 1

DUK Knowledge Centre- Library and Information Services

1. New/Continuing/Spillover : Continuing
2. Type of the Scheme : State Plan Scheme
3. Financial Outlay : Rs. 120 Lakhs
4. Objectives (2024-25)

Sl No	Objectives
1	To transform the University Library into a Knowledge Centre by equipping it with the necessary resources, infrastructure facilities, and appropriate information dissemination services to the user community to help achieve the goals of the University.
2	To create a robust information/literature Resource Backup to meet the current and potential information needs of the changing landscape of the Digital University.
3	To develop facilities in the Knowledge Centre to convert it into a facility with the standards of a “Learning Commons.”
4	To develop services keeping in mind the target groups like; (a) the Faculty Members and post-doctoral fellows (b) Research Scholars and project staff (c) the PG students of Courses under MTech & MSc (d) Users from other Universities of Kerala as an outlier category
5	To create and sustain a state-of-the-art Modern Knowledge Centre Facility with the appropriate blend of traditional and digital surrogates of information resources.
6	Support the development and use of free and Open Access resources.
7	To ensure program-oriented effective information services match with the teaching-learning trends adopted by the leading Universities of the world
8	To utilize the most appropriate tools, techniques & devices to enhance the academic, research & innovative pursuits undertaken
9	To help enhance and map the productivity of scholarly activities of the University by widely accepted metrication methods and practices
10	To conduct Short Term Online & Offline Training Programmes for internal and external target groups in skill development & competency building in (a) Technology-intensive information handling and usage, (b) Topics in Research Methodology (c) Topics in IQAC, etc.

11	To support the Consortia Initiatives among the University Libraries in Kerala for optimizing the resources, possibly under the umbrella of KSHEC.

5. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Procurement of books on various subjects	1500
2	Subscription to databases	4
3	Subscription to online services	10
4	Conducting National level events	4
5	Conducting international-level events	1

6. Outcome of the Project (2024-25)

Sl No	Outcome
1	Creating a standard collection of information Resources
2	Enhanced Learning and Research output
3	Assurance of Quality
4	Hike in Placements/Acceptance of the Students in the job market
5	Enhanced Information Literacy and Life-long learning skills for the students
6	Better Visibility of the University
7	Enhanced Scope for Externally Funded Projects & Networking with leading institutes in India and abroad

7. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Procurement of information resources of various formats.
2	Creation of sustained/perpetual Access facilities to the relevant databases & contents required by the user community.
3	Commencement of training programs to teach Information Literacy skills.
4	Starting several innovative information services to utilize the resources for academic, research and innovative programs undertaken by the University.
5	Will play a significant and participatory role in the academic & research programs of the University.
6	Extending the in-house resource facilities & services to the external users, especially from within Kerala, following the Policy of the University and the publishers.
7	Will acquire facilities of international standards in the newly coming up Knowledge Centre building to facilitate the learning process.
8	Conduct national and international events to bring experts in the field of Information Science
9	Making the Knowledge Centre into a model information resource center for other institutes in India.

8. Objective and physical progress (2022-23 & 2023-24):

Sl No	Objectives	Physical achievements of each resource person and cumulative achievements.
1	Managing the University Library into a Knowledge Centre by equipping it with the necessary resources, infrastructure facilities, and appropriate information dissemination services to the user community so as to help achieve the goals of the University.	Full-time Management of the Knowledge Centre Assisting the full-time management of the Knowledge Centre **Cumulative Achievements:** Procured 743 books Subscribed to ▪ Web of Science ▪ IEEE Xplore (ASPP+POP ALL) ▪ Springer Nature 1700+ E-Journals Collection ▪ ACM Digital Library ▪ Wiley Online Library ▪ Science Direct (Comp. Sc. & Mgmt) ▪ Scopus ▪ Overleaf-An online latex editor ▪ Turnitin - Plagiarism checker ▪ Grammarly ▪ DELNET ▪ Edzter (E-Magazines & E-Newspapers) ▪ Canva- Graphic design platform Index to the collection made using KOHA
2	To create a strong information/literature Resource Back Up to meet the current and potential information needs of the changing landscape of the Digital University.	Beyond the above-mentioned acquisitions steps are being taken to include the back files of journal databases and their indices.
3	The target groups include : (a) the Faculty Members & Researchers (b) the PG students of the new and existing streams of Courses under MTech & MSc (c) Users from other Universities of Kerala as an outlier category	We have provided access to all stakeholders through campus-wide networks & remote access. We also help people from outside in satisfying their information needs.
4	To create a treasure house of e-Books *on a need-based*	Became part of three library networks namely DELNET, INFLIBNET &

	mode with perpetual access facility, if so warranted, as an institutional -cum- regional support mechanism targeting the academic community, spread across all the Universities of Kerala.	KSHEC network. Also have become part of the National Digital Library (NDL).
5	To stress on free and open source publications, wherever possible.	Knowledge Centre provides training in the making and utilization of Open Access publications. We also have established an Open Access IR
6	To adopt the policy of arranging subscription of e-Resources through intermediaries like Elsevier, Packt Publishing limited, World Scientific, Cambridge University Press with a view to (a) expand the Content base, (b) optimize the limited fiscal resources & (c) fight against the monopolistic pricing policies of multi-national publishers.	Subscriptions to databases have already been done to expand the Knowledge base. We supply the users with micro documents collected through inter-library loans and those retrieved from social media platforms.
7	To ensure program-oriented effective information services match with the teaching-learning trends adopted by the leading Universities of the world	We provide orientation to students classes-wise. The faculty select the books and databases based on the curriculum.
8	To utilize the most appropriate tools, techniques & devices to enhance the academic, research & innovative pursuits undertaken	Knowledge Centre trains the users in the usage of various tools for research.
9	To help enhance and map the productivity of scholarly activities of the University by widely accepted metrication methods and practices.	Knowledge Centre maintains the matrices of scholarly productivity.
10	To conduct Short Term Online & Offline Training Programmes for internal and external target groups in skill development & competency building in (a) Technology-intensive information handling and	Conducted two talks to enhance Information Literacy among the users of the Knowledge canter and outsiders.

	usage, (b) Topics in Research Methodology (c) Topics in IQAC, etc.	

9. Financial Outlay (2024-25)

Sl No	Components	Amount (Rs in lakhs)	Remarks
1	Infrastructure Developments	5.00	Infrastructure development of Knowledge Centre which includes hardware, software, furniture's etc.
2	Collection Development: Purchase of Books (including e-Books); Consumables, AMC, Travel Contingency etc.	70.00	Books – Print Versions, b. e-Books Packages of various Publishers for perpetual Access including Web of Science, IEEE, Springer, Wiley, Packt, McGraw Hill, Elsevier, Pearson, Cambridge University Press, World Scientific, ACM etc. c. Print Journals +e-Journals : Select & Customized Packages & Databases of different Publishers and related to the Core Activity Areas of the University.
3	Resource Expenses	40.00	Includes Librarian, Library Assistants & other resource persons
3	Consumables, AMC, Contingency etc	5.00	Consumables, Contingency etc.
	TOTAL	**120.00**	

Component 2:

School of Computer Science and Engineering (SoCSE)

New/Continuing/Spill over : Continuing

Type of the Scheme : State Plan Scheme

Financial Outlay : Rs 220 Lakhs

Objective/Physical Target :

School of Computer Science and Engineering to become a world-leading centre

of advanced learning, research and development, and societal outreach in the field of Computer Science and Engineering. The thematic research areas include theoretical computer science, computational intelligence, and systems & networks.

- World class research and academics with national and international collaborations.
- Nurturing globally competent and socially responsible talent pool through academic programmes.
- Commercialization of research outcomes through consultancy, collaborative new business initiatives and promotion of entrepreneurship.
- Creating an inclusive and collaborative environment to foster local, sustainable and globally relevant knowledge and expertise.

Research Centers under School of Computer Sciences & Engineering

A. Centre of Excellence in Pattern and Image Analysis (CEPIA)

1. Objectives (2024-25)

Sl No	Objectives
1	a) Develop a new feature extraction technique to analyze the ROIs in the brain network b) Analysis of feature extraction techniques for the detection of neurodegenerative diseases with the aid of graph learning approaches.
2	a) Develop a new methodology to generate relationship between the ROIs in the brain network b) Analysis of relationship methodology for detection of neurodegenerative diseases using graph learning approaches.
3	Develop new Deep Learning for object detection and classification using Circular Mesh based Shape and Margin Descriptor (CMSMD)
4	Upgrade Circular Mesh based Graph Descriptor
5	Study the palm venous anatomy to identify more prominent features.
6	Develop vein database ground truth by combining existing segmentation methods
7	Experiment with partial palm vein graphs for authentication
8	Evaluate the possibility of partial graph completion

2. Planned Activities (2024-25)

No	Planned Activities/Target	In Units
1	New deep learning models	5
2	Development of disease detection application using the proposed deep learning methods	5
3	Internship for the students	4
4	Research outcome	6
5	Publications	6
6	Study the palm venous anatomy to identify more prominent	2

	features. - In-depth study of anatomical palm vein features - Applying Image processing techniques to extract the unique features - Usage of the unique features for authentication	
7	Develop vein database ground truth by combining existing segmentation methods - Experiment with several vein extraction methods to form an ensemble of results for forming ground truth.	1
8	Experiment with partial palm vein graphs for authentication - Convert partial palm vein images into graphs - Experiment to study the possibility of using the partial vein graphs for authentication	2
9	Evaluate the possibility of partial graph completion - Study the feasibility of graph completion techniques to be used for vein completion.	1

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Deep learning and Graph Neural Network	2021-2024
2	Design of Deep architecture based on studies done on fMRI and other brain imaging	2023-2025
3	Design of brain Atlas	2022-2024
4	Diagnosis of Neurodegenerative diseases using brain Atlas	2022-2024
5	Design of feature extraction technique	2023-2025
6	Design of connectivity extraction methodology	2023-2026
7	Diagnosis of Neurodegenerative diseases using brain graphs	2023-2026
8	Study the palm venous anatomy to identify more prominent features.	2024 April- 2025 March
9	Develop vein database ground truth by combining existing segmentation methods	2024 April- 2025 March
10	Experiment with partial palm vein graphs for authentication	2024 April- 2025 March
11	Evaluate the possibility of partial graph completion	2024 April- 2025 March

4. Outcome of the Project (2024-25)

Sl No	Outcome
1.	a) The technique enabled the extraction of relevant features that captured the variations in brain network connectivity, enabling a more accurate characterization of ROIs. b) Provided a substantial improvement in diagnostic accuracy for early disease detection. c) Provided a deeper understanding of the brain network.

2.	a) The new methodology has improved our ability to map and understand the complex connectivity patterns between ROIs in the brain b) The successful integration of this methodology with graph learning approaches gave the ability to monitor and accurately diagnose neurodegenerative diseases. c) It led to advancements in our understanding of brain disorders and healthy brain functioning.
3.	The object detection and classification becomes easy with the aid of the proposed Deep Learning technique.
4.	Structural activities as well as the functional activities of brain can be mapped using the proposed Circular Mesh based Graph Descriptor
5.	An algorithm using unique palm vein features for individual authentication
6.	Ground truth for effective palm vein segmentation
7.	Partial palm vein graph-based algorithm for individual authentication
8.	Possibility of an effective partial graph completion algorithm
9.	Research publications in palm vein biometrics.

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	a) Modeled an innovative feature extraction technique for analyzing Regions of Interest (ROIs) within the brain network. b) Extracted features measure the connectivity, network properties, or other relevant metrics. c) Develop a model using these features and classify the neurodegenerative disease using this model.
2.	a) Develop a methodology for calculating the relationship between the connectivity in the brain ROIs. b) Extracted more features using these connectivity. c) Develop a graph model using the connectivity property as well as the node properties. d) Check the model in the neuro degenerative diseases detection.
3.	a) Different modules of Circular Mesh based Shape and Margin Descriptor (CMSMD) will be converted into layers of Deep Learning architecture. b) Performance of the system will be evaluated by implementing it on the detection of Neurodegenerative diseases.
4.	Graph Neural Network will be implemented for the detection of structural deformations and the functional activities of brain New architectures will be developed based on the functional activities of human brain.
5.	Even though the presence of an arch-like pattern was identified, it requires more study to identify the features that makes the palm vein pattern unique. More anatomy-based studies are required to identify the difference in orientation, position and other features of the veins that connect to the central arch. This may help in developing an algorithm for individual authentication.

6.	Lack of groundtruth deters the efficient usage of deep learning algorithms for palm vein authentication. Therefore, a combination of algorithms will be used to develop groundtruth which could be used for deep learning.
7.	The partial palm vein pattern will be converted into graphs. These graphs will then be used for developing algorithms for individual authentication. This could lead to more secure authentication technique.
8.	The vein patterns are unique for each individual which makes it difficult to predict or complete the palm vein pattern. Therefore, the possibility of completing partial palm vein graphs will be evaluated.

10. Physical Progress (2022-23) & (2023-24)

Sl No	Objectives	Physical achievements of each resource person and cumulative achievements.
2022-23		
1.	a) Develop a graph-based learning technique for the resting state brain fMRI images b) Improve the graph-based feature extraction and classification method of resting-state brain fMRI images	Developed a novel graph-based learning technique and checked the model accuracy in the AD and ASD detection. The system Shows an accuracy of 96 % in AD and 92 % in ASD datasets.
2.	Study the changes in static to dynamic nature of graph using brain fMRI images	Collected the dataset of brain fMRI images from both healthy individuals and neurodegenerative diseases Constructed a static brain connectivity graph Dynamic brain connectivity graph construction is ongoing.
3.	Develop a graph connectome for attention network in resting-state brain fMRI images	Developed a graph connectome model and the testing is in progress
4.	Develop deep learning models motivated from the studies of fMRI for object detection and classification	Development of the model is in progress.
5.	Develop a brain Atlas using CMSMD	Parcellation of Cortex and ventricles done. Writing paper based on the study conducted.

6.	Develop methodologies to label and solve neurodegenerative disease using brain Atlas	Alzheimer's and Hydrocephalus were able to detect based study conducted. Writing paper based on the study conducted.
7.	Developing a deep learning-based palm vein pattern segmentation.	Experimented with several methods. However, the lack of ground truth in the databases proved a deterrent to the algorithm development.
8.	Evaluating the possibility of using anatomical features in palm vein recognition.	• Identified superficial veins in the network forming an arch-like pattern with its convexity downward. This is present in all palms. The uniqueness for each individual is provided by its orientation and point of connection with other veins.
9.	Developing a desktop-based Augmented Reality application.	Developed an application by recreating a scene from the scene description using HoloSDK.
2023-24		
1	To develop Knowledge graph based deep learning technique for object detection and classification and compare the performance with the state of the arts system	Developed Circular Mesh Graph Neural Network (CmGNN) for object detection and classification.
2	To improve the performance of different types of object detection and classification by the proposed graph based deep learning technique.	Improved the accuracy by adding new features and Feature Norms.
3	To develop an automated technique for the identification of vertices and edges from image objects and thereby generating new automated image to graph conversion techniques.	Developed an automatic technique for creating a graph structure from images.
4	To study and analyse the nature and behaviour of COVID Microbes and its detection	Not able to do this work due to the unavailability of dataset
5	Developing a secure palm vein biometric system by representing the vein pattern as graphs and by using graph convolutional neural networks.	Successfully developed unique palm vein graphs. However, could not use it with graph convolutional neural networks due to the lack of a ground truth database.

6	Developing a vein recognition/authentication algorithm using partial vein images with the help of deep learning techniques.	● Developed a novel partial palm vein authentication system. ● Paper titled " Partial Palm Vein Based Biometric Authentication" has been published in the Journal of Information Security and Applications (JISA),

B. Center for Excellence in Brain Computing

1. Objectives (2024-25)

Sl No	Objectives
1	To create a comprehensive tool or system that helps educators and institutions assess and improve student engagement, focus, and participation in virtual learning environments.
2	Develop a novel technology for diagnosis of neurodegenerative diseases using fmri images. Analyze the BOLD signals and extract the features of each brain area.
3	To improve object detection by contextually aware decision-making
4	To identify the un uttered speech of patients who are not able to speak due to accidents,injuries or stroke using EEG

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Students' Attention Monitoring System in online Classroom	2
2	Diagnosis of Neurodegenerative Disease	2
3	Visual Attention Modeling	2
4	Cognitive Speech Recognition	2
5	Postgraduate course for Cognitive Computing	1
6	Workshops/conference related to Brain computing	2

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise (2024-2025)
1	Advance studies can be carried out in the following areas ● An Attention and visual monitoring and tracking system for online classes for monitoring different behavioral aspects like mood, sleepy, lazy, listening etc. ● Development of an AI-enabled online exam impersonation and cheating detection system ● Detection of foreign aids using AI techniques during online examinations. Resume raking using NLP	April-Sept

2	Diagnosis of Neurodegenerative disease using image processing techniques will be done. In the previous year Studies were done to detect/ diagnose neurodegenerative diseases. ● Developing a novel deep learning approach for the automated diagnosis of Normal Pressure Hydrocephalus. ● Developing a Classification system for Mild Cognitive Impairment and Normal Control Using fMRI features and Deep Learning. ● Developing a study for the detection of Alzheimer's using hippocampal atrophy of brain MRI.	April-Sept
3	To design a better performance model close to the human observer by incorporating attention mechanisms at behavioral and neural level which can be applied to areas such as attention analysis, robotic vision, marketing, automated learning platforms etc. ● This newly derived methodology can be implemented for image and object classification.	Oct-March
4	A Novel BCI Technology based Imagined Speech Recognition for SpeechDisabled Community has to be developed. ● For that purpose various hierarchical methods are currently being tried . ● Non invasive EEG acquisition has started	Oct-March

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	Attention monitoring system
2	A novel method for detecting neurodegenerative diseases
3	A model which can identify the salient object in a scene.
4	Imagined Speech Recognition tool for the beneficial of Speech disabled population

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	A novel behavioral approach to student engagement detection using multiple attributes from face and head has to be done
2	This proposal aims to develop tools and technologies in cognitive computing which helps to provide better diagnostic tools, accurate data analysis and evidence-based recommendation to patients, better level of

	customer interactions etc. We have to extract the features of BOLD signals of each brain area and develop a deep learning model using these features.Also we have to check the accuracy of the model using neurodegenerative disease dataset.
3	Incorporation of Fixations and Scanpath studies to focus on the most significant objects within a scene & Prediction of scanpath from Fixations has to be done
4	The Imagined Speech Recognition system represents a significant leap forward in assistive technology, empowering speech-disabled individuals to communicate effectively through their thoughts. This project aims to develop an assistive system to enhance the lives of those who have been marginalized by speech disabilities, fostering independence, social inclusion, and improved overall well-being by combining brain-computer interfaces with AI-driven speech recognition systems.

6. Physical Progress

Sl No	Objectives	Physical achievements of each resource person and cumulative achievements.
1	Students' Attention Monitoring System in online Classroom	An EEG based binary classification model to detect confusion using 1DCNN-A learning scenario has been completed.
2	Diagnosis of Neurodegenerative Diseases	Developed a graph neural network model and tested with ADNI dataset.
3	Visual Attention Modelling	A model which can identify the salient object in a scene using eye gaze has been completed.
4	Cognitive Speech Recognition	5 vowels and 4 words classification model done. Got ethical clearance for Real EEG data collection.2 research paper works completed.
5	Postgraduate course for Cognitive Computing	Started:2nd batch classes are going on in DUK.Signed Mou with NIMHANS for starting a collaborative course in NIMHANS

- If it is Women related Scheme: Yes- The Center of Excellence in Brain Computing Project is a multidisciplinary research initiative aimed at advancing our understanding of brain-computer interfaces (BCIs) and their applications. The project is committed to promoting gender equality in science and technology by actively involving women in various aspects of the research and development process.
- If the scheme is benefited to Children: Yes- The Children's Scheme within the Center of Excellence in Brain Computing

Project is designed to address the specific needs of children, including those with neurological disorders or developmental challenges. It aims to harness brain-computer interface technology to improve the lives of children and enhance their access to education, healthcare, and overall well-being.

- If the scheme is related to SC/ST: Pls give the details : Yes- The Centre of Excellence in Brain Computing Project recognizes the importance of equal access to cutting-edge technology and education for all, including the SC/ST communities. This project seeks to bridge the digital divide and empower individuals from marginalized communities with brain-computer interface technology.

C. Virtual Resource Centre for Language Computing (VRCLC)

1. Objectives (2024-25)

Sl No	Objectives
1	To create a spoken corpus of ethnic/tribal Dravidian languages
2	To create a spoken corpus of disordered Malayalam speech
3	To Build Speech Recognition system for very low resource ethnic languages
4	To develop ASR system for disordered Malayalam speech
5	To build technological infrastructure for Assistive Technology tools (ASR and TTS) for visually challenged
6	To build infrastructure for Malayalam Spelling and Grammar Check Tool - Beta version
7	To build multilingual Machine Translation system - Beta Version

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Low Resource Ethnic Language Speech Corpora Creation	1
2	Spoken Corpora creation for Disorderd Malayalam Speech	1
3	R&D of Speech Recognition system for very low resource ethnic languages	1
4	R&D of Automatic Speech Recognition tool for Disorderd Malayalam Speech	1
5	R&D of Automatic Speech Recognition system for Malayalam Speech	1
6	R&D of Text to Speech tool for Malayalam	1

7	Multilingual Machine Translation - Web based tool	1
8	Malayalam Grammar & Spell Checker System: Beta Version	1
9	R&D of Articulatory Evaluation System from Speech	1
10	Design and Development of Malayalam Unicode Fonts	1

3. Project Phasing (Year Wise)

Sl. No.	Description	Year Wise (2024-25)
1	Speech Corpora creation: Ethnic/Tribal Languages	Apr- Sept
2	Speech Corpora creation: Disordered Malayalam Speech	Apr- Sept
3	Malayalam Grammar & Spell Checker System Development	Apr- Sept
4	Initial design and conceptualization of Malayalam Font	Apr- Sept
5	Development of ASR framework (Malayalam Speech)	Sept- Dec
6	Development of TTS framework	Sept- Dec
7	Multilingual Machine Translation - Web based tool	Sept- Dec
8	Deep Learning system training for Articulatory Evaluation	Jan-March
9	Font Development Testing and Design Iterations	Jan-March
10	Development of ASR framework (Disabled Speech, Ethnic/Tribal language Speech)	Jan-March

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	Speech Corpora for Endangered Languages (20 hours)
2	Speech Corpora creation: 60 K
3	Automatic Speech tool for Disabled (Targeted for Blind, Deaf and dumb and Autism) [Beta]
4	MT system for cross lingual platforms Beta version
5	Grammar rule creation for Malayalam Grammar Checker System, implementation.
6	Beta version of the Grammar & Spell checker system for Malayalam language.
6	Calligraphic Malayalam Font
7	Beta version of speech disorder evaluation tool
8	Development of ASR framework

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*

1	This proposal aims to develop tools and technologies to promote research and development in Malayalam Language Technology. The main objective is to create text and speech corpora for Malayalam Speech Recognition tools, develop Machine Translation (MT) system tools, Automatic Speech Recognition System in Malayalam language, Speech articulatory evaluation system, Malayalam Font and also a combined version of grammar & spell checker system for Malayalam language.

6. Physical Progress

Sl. No.	Objectives	Physical achievements of each resource person and cumulative achievements.
1	Speech Corpora Creation & Collection	130 K corpus from different sources are collected for Corpora Development
2	Tools for Malayalam Speech Recognition System	15 K Speech corpora from different sources are created for ASR tool development
3	Malayalam Grammar & Spell Checker System Tool	Created a few Malayalam grammar rules & word dictionaries for the implementation of grammar checker system.
4	Tools for Malayalam Machine Translation System	Malayalam Translation system (Beta version) for cross lingual platform is in development stage.
5	Automatic Speech Recognition System	Automatic Speech Recognition System is in development stage.
6		Planning and coordination of the translation of First Year Engineering Degree and Diploma text books by AICTE to Malayalam.

D. Sixth Sense : A Centre of Excellence in Cognitive Computing

1. Objectives (2024-25)

Sl No	Objectives
1	Enhancement of Cognitive Computing Lab infrastructure
2	Enhance Research outputs responsible AI and Applications
3	Development and implementation of at least two socially relevant use cases of responsible AI
4	Development of a long term training program in AI Ethics and Sustainability

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Enhancement of Cognitive Computing Lab infrastructure	1
2	Enhance Research outputs responsible AI and Applications -Recruitment of dedicated human resources -Increase the intake of research inters in this project	1.5
3	Development and implementation of at least two socially relevant use cases of responsible AI -Recruitment of necessary human resources -Identification of opportunities and Design of solutions	1.5
4	Development of a long term training program in AI Ethics and Sustainability -Establishing collaborations with relevant stakeholders -Recruitment of human resources -Development of course content and launch of the program	1

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Enhancement of Cognitive Computing Lab infrastructure	2024 April – 2024 September
2	Enhance Research outputs responsible AI and Applications	2024 April - 2025 March
3	Development and implementation of at least two socially relevant use cases of responsible AI	2024 April – 2025 March
4	Development of a long term training program in AI Ethics and Sustainability	2024 June – 2025 March

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	State of the art lab infrastructure for reasearch and training
2	Produce at least five journal publications in the area of responsible AI and Applications
3	Implementation of solutions for two socially relevant problems with responsible AI
4	A 60 hour duration training program in the area of AI Ethics and Sustainability

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Enhancement of Cognitive Computing Lab infrastructure - Enhance the lab infrastructure to use DGX hardware - DGX hardware enhancement
2	Enhance Research outputs responsible AI and Applications -Recruitment of dedicated human resources -Increase the intake of research inters in this project
3	Development and implementation of at least two socially relevant use cases of responsible AI -Recruitment of necessary human resources -Establishing collaborations -Identification of opportunities and Design of solutions
4	Development of a long term training program in AI Ethics and Sustainability -Establishing collaborations with relevant stakeholders -Recruitment of human resources -Development of course content and launch of the program

6. Physical Progress

Sl No	Objectives	Physical achievements
2022-23		
1	Enhancing compute and data infrastructure for Cognitive Computing Research, Training and Projects.	Procurement of special purpose hardware in progress.
2	Enhance the existing research/practice capabilities in Cognitive Computing/Machine Learning Start the research practice in Ethics and Policies relating Artificial Intelligence and Cognitive Computing.	Hired twe research engineers with PhD/Master of Engineering degrees 2) Research works started in AI Ethics/Responsible AI. Five research articles published. Three research articles in pipeline
3	Building the resource capability for the development of solutions to socially relevant and business relevant problems	2) Two research engineers, two PhD students and ten masters students started working in this area
4	Design and implementation of new certification programs and workshops	Designed and delivered a masters level course in AI Ethics and Sustainability. Another course is getting designed.

5	Design and implementation of long term training programs promoting research and entrepreneurship.	Research track created in AI Ethics/Responsible AI. Six months (one semester) master level course designed and launched in AI Ethics and Sustainability.
2023-24		
1	Establish a CoE in Responsible AI and Deep Learning. Enhancing compute and data infrastructure with NVidea DGX hardware.	Lab infrastructure with NVidea DGX A100 Machine established.
2	Enhance research practice in AI Ethics and Sustainability. Start consulting practice in Responsible AI.	10 PG students and 5 PhD students currently work in this area. Two journal papers and one conference paper published. Three journal papers under review.
3	Develop solutions for socially relevant problems using responsible AI techniques.	1) Generative AI prototype for age transformation is developed with potential applications to police forces 2) Deep learning based image document parsing prototype developed and is discussion with a government agency for potential use.
4	Design and implementation of a long term certification program in responsible AI	Development of a training program in RPA in progress

E. Centre for Research and Innovation in Cyber Threat Resilience (CRICTR)

1. Objectives (2024-25)

Sl. No	Objectives (2024-25)
1	Conducting advanced research in cyber security
2	Developing tools for cyber crime detection and prevention
3	Conducting cyber security awareness programs
4	Conducting online courses and training programs in cyber security
5	Supporting M.Sc and M.Tech programs in Cyber Security at the Kerala University for Digital Sciences, Innovation and Technology

6	Supporting PhD research in Cyber security
7	Women Empowerment in Cyber Security
8	To set up a state-of-the-art cyber security facility at KUDSIT.
9	Developing automated security response platform

2. Planned Activities (2024-25)

Sl No	Planned Activities (Physical Target)	Units
1	Cyber Security Research, Development, National-International Collaborations	4
2	Cyber Security Education, Training, Workshops, Conferences, Content Development	4
3	Women Empowerment in Cyber Security	2

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Develop malware detection mechanisms for Android	2024 April -2025 March
2	Develop malware detection mechanisms for IoT	2024 April- 2025 March
3	Develop mechanisms for Drone security	2024 April- 2025 March
4	Developing quantum computing algorithms	2024 April- 2025 March
5	Conducting training programs and workshops in Cyber Security	2024 April- 2025 March
6	Conducting short term course/training to the employees from Govt, industries, academic institutions	2024 April- 2025 March
7	Develop an advanced tool for automating security operations.	2024 il- 2025 March

4. Outcome of the Project (2024-25)

Sl No	Outcomes
1.	Research publications, books, and patents
2.	Tools for cyber crime detection and prevention for public use
3.	Assisting government and police in cyber crime cases
4.	Generating manpower with high technical skills in cyber security
5.	Empowering women in cyber security
6.	Making KUDSIT as a centre of excellence in cyber security
7.	A mechanism that can detect adversarial attacks in Android malware detection.
8.	An automated security response platform

9.	Algorithms for quantum computing and quantum machine learning
10.0	Developing detection mechanisms for sophisticated and adversarial IoT and Android malware
11.1	Developing Artificial intelligence based cyber security mechanisms
12.	Tools for estimation of security risk of Android applications
13.	Trained people in cyber security

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1.	Android Malware Detection We plan to develop a defense mechanism against adversarial attacks in Android malware detection. Genetic algorithms and GCN will be used for developing malware detection mechanisms.
2.	IoT Malware Detection We plan to develop mechanisms for detection of IoT malware. Opcode of applications will be converted images and analyzed. Dynamic detection mechanisms will also be developed.
3.	Developing automated security response platform In this work, we plan to design and develop an advanced tool for automating security operations. The development will be done as follows:- 1. We will develop a business-level requirement capturing module. Using this module, security requirements at the business level will be translated to security requirements at the asset level, respecting the dependency among assets. 2. We will compute the security posture from the possible attack scenarios on the enterprise network. Attack scenarios generated from the existing tools will be translated in a proper format suitable for the analysis. We will encode an automated security gap computation module that will determine the appropriate security controls. Security requirements and security posture, both will be used while determining the security gap. A list of the existing security controls will be fed as input for the automatic selection of the implementable controls.
4.	Developing artificial intelligence based cyber security mechanisms. As cyber attacks grow in volume and complexity, artificial intelligence (AI) is used for building smarter cyber security systems. Security professionals need strong support from intelligent machines and advanced technologies like AI to work successfully and protect their organisations from cyber attacks. Nowadays, AI, machine learning, natural language processing, data analytics, cognitive computing etc are used to build systems that can respond to threats with greater accuracy and speed. In this work we plan to analyse, predict, and defend cyber attacks by means of AI techniques.

5	Estimation of security risk of Android applications The proliferation of mobile devices has given birth to a new era in communication called “mobile era”. A large number and wide variety of feature-rich applications are knocking our door every day. Like any other software, Android applications also have certain risks, which might have been maliciously included or inadvertently coded by nescience developers. Some of these risky applications might be exploited to launch an attack against the owner. We are planning to estimate the risk value of an application. Users will be encouraged to use applications with low risk value.
6	Adversary drone detection: A framework for authenticating drones in a UAV network This project aims at developing a security framework for a network of unmanned aerial vehicles (UAVs) by embedding a unique hardware fingerprint into the drone to protect it from duplication. The system makes use of hardware fingerprinting techniques for the drones combined with drone operator authentication for generating a unique drone signature.
7	Conducting cyber security training and certification programs for academic, general user, industry people and government employees We plan to regularly conduct customized practical training programs for government employees, working professionals, students and teachers on various aspects of information security. We plan to deliver expert instructions with hands-on labs to impart training for acquiring latest security skills for protecting, government, corporate and civilian digital assets.
8	Conducting cyber security awareness programs specially targeted to women and school children We propose to conduct Cyber Security Awareness Program for Women & Children designed specifically for the safety of women & children. The program will focus on very sensitive issues towards the cyber safety of women and children.

6. Physical Progress

#	Objectives	Physical achievements of each resource person and cumulative achievements.
2022-23		
1	Conducting advanced research in cyber security	Developed a dynamic Android malware detection mechanisms. Explored malware attacks in IoT. Developed mechanisms for computing the risk score of Android applications. Developed mechanism for authentication of Drones. Research Journal Publications 7. Detection of Malware Applications from Centrality Measures of Syscall Graph, Roopak S., Tony Thomas, Concurrency and Computation: Practice and Experience, Wiley, 2022.

		8. Gemini George, Sabu M. Thampi, Combinatorial Analysis for Securing IoT-Assisted Industry 4.0 Applications From Vulnerability-Based Attacks. IEEE Trans. Ind. Informatics 18(1): 3-15 (2022) Book Publications Intelligent Mobile Malware Detection, Tony Thomas, Roopak Surendran, Teenu S John, Mamoun Alazab, CRC Press, Taylor and Francis, Dec 2022
2	Developing tools for cyber crime detection and prevention	Developed tools for malware detection
3	Conducting cyber security awareness programs	Conducted One Week Course on Cyber Hygiene Practices during September 14-20, 2022 Hosted "DUK CTF 1.0" (CAPTURE THE FLAG CHALLENGE) on October 30, 2022, Conducted "CYBER HYGIENE PRACTICES" (A Cyber Security Awareness Program) during September 14-20, 2022 and September 26-30, 2022. Conducted "BE CYBER SMART" (A Cyber Security Awareness Program) during October 10-14, 2022. Conducted "DIGITAL SAFETY" (A Cyber Security Awareness Program),during November 7-11, 2022. Conducted "BE AWARE BE SECURE" (A Cyber Security Awareness Program) during November 14-18, 2022.
4	Conducting online courses and training programs in cyber security	Two Days National Webinar on "Cyber Security & Cyber Crimes" on July 4 & 5, 2022.
5	Supporting M.Sc and M.Tech programs in Cyber Security at the Kerala University for Digital Sciences, Innovation and Technology	The number of students for M.Sc Cyber security increased from 36 to 61 Started M.Tech in Cyber Security Engineering.
6	Supporting PhD research in Cyber security	Four new Ph.D students have joined for doing research in Cyber Security.
7	Women Empowerment in Cyber Security	Conducted One-Week Course on Cyber Hygiene Practices during September 14-20, 2022. Sixty four students of the final year computer engineering program of Government Women's Polytechnic College

		participated in this course. Conducted "DIGITAL SAFETY" (A Cyber Security Awareness Program) for differently-abled female students of Govt Polytechnic College Kaimanam, Trivandrum, during November 7-11, 2022.
8	To set up a state-of-the-art cyber security facility at KUDSIT.	Cyber security lab for M.Sc and M.Tech cyber security students is established.
2023-24		
1	Conducting advanced research in cyber security	A GCN based malware detection mechanism for adversarial malware has been developed. A journal paper submitted. A Data Flow-Based Approach for Classification and Risk Estimation of Android Apps is developed
2	Developing tools for cyber crime detection and prevention	Developed tools for malware detection and risk estimation of Android Apps
3	Conducting cyber security awareness programs	Hosted Google Developer Student Clubs Wonder of Wonders (GDSC WOW) on April 29-30, 2023. Conducted a two-week short course on SECURE YOUR CYBERSPACE during May 15 to 26, 2023. Hosted a seminar on Cyber Security for District Institute of Education and Training (DIET) Attingal on May 19, 2023. Conducted a one-day workshop on Digital Signature and PKI with CDAC Bangalore and CCA on May 29, 2023. Conducted a four-week course on BE CYBER SMART: SECURE YOUR DIGITAL LIFE during May 10 to June 2, 2023. Hosted a one-day workshop on Google IO Extended on June 10, 2023. Conducted a one-day awareness program on Plan your Future: Cyber Security Awareness for Early Career Professionals on July 8, 2023. Conducted a one-day awareness program on "Navigating the Cyber Security

		Landscape: Essential Training for Career Starters" on July 15, 2023.
4	Conducting online courses and training programs	Online courses are planned
5	Supporting M.Sc and M.Tech programs	One batch each of M.Sc Cyber security and M.Tech in Cyber Security Engineering graduated
6	Supporting PhD research in Cyber security	Applications invited for admitting new Ph.D students in Cyber Security.
7	To set up a state-of-the-art cyber security facility at KUDSIT.	Cyber security lab for M.Sc and M.Tech cyber security students is ready. A lab of cyber security research students is also ready.

F. Augmented and Virtual Reality Centre (AVRC)

1. Objectives (2024-25)

Sl No	Objectives
1.	Develop VR applications for telemedicine
2.	Evaluation of the security aspects of the metaverse and avatars.
3.	Develop an AR dashboard for 3D visualization
4.	Study the possibility of AR-based cyber attacks

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1.	Develop VR applications for telemedicine - Integration of VR medical visualization module to telemedicine application - Study the effectiveness of the VR telemedicine application - Evaluate the security aspects of the application	2
2.	Evaluation of the security aspects of the metaverse and avatars. - Develop a framework for avatar creation - Study the challenges related to security in metaverse and avatars, in particular.	1
3.	Develop an AR dashboard for 3D visualization - Perform computations and predictions using machine learning algorithms in time-series data. - Develop an AR application deployable for visualizing real-time predictions.	2
4.	Study the possibility of AR-based cyber attacks - Experiment with the immersion and occlusion-based attacks	1

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise

1)	Develop VR applications for telemedicine	2024 April -2025 March
2)	Evaluation of the security aspects of the metaverse and avatars.	2024 April- 2025 March
3)	Develop an AR dashboard for 3D visualization	2024 April- 2025 March
	Study the possibility of AR-based cyber attacks	2024 il- 2025 March

4. Outcome of the Project (2024-25)

Sl No	Outcome
1.	A VR application that could make telemedicine more immersive.
2.	An AR application for 3D visualization of real-time prediction of relevant time-series data like weather.
3.	Research publications and patents in AR/VR

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
6.	Even though Telemedicine applications help people connect to a specialist located in any part of the world, they often lack the personal connection that a physical appointment gives. The physical appearance of a doctor gives mental assurance to the patients. A VR application could give an immersive feeling to the telemedicine application wherein the patients will feel the presence of the doctor in the virtual room.
7.	The use of metaverse and avatars is increasing. However, most of us are oblivious to the security impacts of the same. Thus, a thorough study of the security effects is required. Also, first-hand evaluation of the in-house developed metaverse and avatars will be performed.
8.	Few approaches exist that seamlessly integrate machine learning into web-based augmented reality (AR) applications. These technologies will be leveraged to perform computations and predictions using machine learning algorithms on real-time-series data like weather. Then, an AR application will be developed to visualize the resultant data in an interactive 3D format.
9.	There are few works that study the security aspects of AR-based applications. Various experiments will be performed to determine the effect of occlusion and immersion-based attacks on AR applications.

7. Physical Progress

Sl No	Objectives	Physical achievements of each resource person and cumulative achievements.
2023-24		

1.	To setup state-of-the-art research, development, and testing facility for advanced algorithms, applications, and methods in Immersive Visualization at KUDSIT	Lab infrastructure with HP Workstation (32 GB RAM, 12th Gen. Intel I9 Processor, Nvidia T400 Graphics Card), established
2.	To collaborate with industries and other R&D teams for facilitating interdisciplinary research and technology development.	
3.	To augment digital education at KUDSIT.	Developing virtual classroom setup for facilitating remote learning.
4.	To develop applications based on industry needs and relevance.	Developing VR application for medical image visualization.
5.	To offer courses and certifications in Virtual & Augmented Reality development.	Developed courses on AR/VR for M.Sc, M.Tech and Ph.D
6.	To give impetus to technology development and incubation, product development and entrepreneurship in Virtual & Augmented Reality	One Ph.D student works in this area. One conference paper has been submitted. Work on another paper is in progress.
7.	To provide industrial training by simulating real-life scenarios using Virtual & Augmented Reality systems.	
2022-23		
1.	To setup state-of-the-art research, development, and testing facility for advanced algorithms, applications, and methods in Immersive Visualization at KUDSIT	Lab infrastructure VR headset, Webcam, and Printer established

2.	To collaborate with industries and other R&D teams for facilitating interdisciplinary research and technology development.	
3.	To augment digital education at KUDSIT.	Developing virtual classroom setup for facilitating remote learning.
4.	To develop applications based on industry needs and relevance.	• Developed AR application for early alphabet learning for preschool kids. • Developed desktop-based AR visualization of a room using a written description of the scene.
5.	To offer courses and certifications in Virtual & Augmented Reality development.	Developed courses on AR/VR for M.Sc, M.Tech and Ph.D
6.	To give impetus to technology development and incubation, product development and entrepreneurship in Virtual & Augmented Reality	One Ph.D student works in this area.
7.	To provide industrial training by simulating real life scenarios using Virtual & Augmented Reality systems.	

G. Next Generation Security Operations Development Centre (NGSOC)

1. Objectives (2024-25)

Sl No	Objectives
1	To develop a Next Generation Integrated Security Operations Centre (NGSOC)
2	To design and develop the state of the art cyberattack modelling platform
3	To design and develop the state-of-the-art log analysis platform
4	To design and develop the next generation software definedcyber defence system
5	To create a skilled workforce with commendable expertise in cybersecurity technologies
6	To support MSc, MTech, and PhD students working in Cyber security
7	To bridge the gender gap in the cyber security sector

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Developing state of the art attack modelling software	First 6 months
2	Developing event log analyser software to detect cyber incidents	First 6 months
3	Developing software defined cyber defence system	Last 6 months
4	Establishing research collaborations with the other laboratories and institutes within the country and abroad	Around the year
5	Supporting M.Sc, M.Tech, and PhD students working in the domain of Cyber Security	Around the year
6	To provide internship opportunities in Cyber Security to students from various institutes and colleges	Around the year
7	To set up a state-of-the-art testing facility for cyber security research and development	Around the year

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Space identification, furnishing, and setting up the Development Centre.	2024-25
2	Recruitment of staff and procurement of the necessary hardware	2024-25
3	Development of the attack modeller	2024-25
4	Development of the log analysis platform	2024-25
5	Development of software defined cyber defence system	2024-25
6	Development of the testing facility	2024-25

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	State of the art Next Generation Security Operations Centre with a high commercialization potential
2	Collaboration with the best cyber security research laboratories and industries
3	Indian/Foreign research students can be attracted to the state-of-the-art facility
4	Research publications and patents
5	Generating manpower with high technical skills in cyber security R&D
6	Empowering women software developers

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Developing state of the art attack modelling software We will develop a state-of-the-artweb-based attack modelling tool that can emulate the attack scenarios in the given network infrastructure. This tool will use attack graphs for modelling multi-hop attacks. This attack graph will be analysed to find the security weak points in the network infrastructure.

2	Developing Event Log Analyser software to detect cyber incidents Log analysis is used to detect security incidents in enterprise networks. Each device generates log records for various events like message passing, message drop, configuration change, etc. These log records will be collected in a central repository and will be analysed to find security incidents. Log storage and log search engines will be created to facilitate the log analysis process. It is possible to do AI-based attack predictions from the collected logs.
3	Developing next generation automated defense system From the attack analysis critical vulnerabilities (weak points) will be identified and from Log analysis security breach is detected with attacker's future intention. Automated defence systems will serve two purposes 1) hardening to strengthen the identified security weak points and 2) incident response to response to ongoing attacks.
4	Establishing research collaborations with the best laboratories and institutes within the country and abroad Best security researchers and industry experts will be approached for their advice while developing the next generation SOC solution. Student exchange programs are also possible with foreign universities.
5	Supporting MSc, MTech, and PhD students working in the domain of Cyber Security Students will be able to work in the state-of-the-art security solution development centre and get a chance to interact with the best researchers and security practitioners.
6	To provide internship opportunities in Cyber Security to students from various institutes and colleges Undergraduate and postgraduate college students will be given internship opportunities in the proposed R&D centre. Students can visit the facility and learn from the experts.
7	To set up a state-of-the-art testing facility for cyber security research and development Using the purchased hardware equipment (and with the existing SDN set up) and the software items proposed to be developed, we will create a world class cyber security testing facility. This facility can be extended later to give service to critical sector organizations.

H. Centre of Excellence in Fast Visual (CEFV)

1. Objectives (2024-25)

Sl No	Objectives
1	To develop a Centre for Fast Visual (CEFV)
2	To analyse and develop platform to capture the fast motion of objects using event camera
3	To analyse and develop state-of-the-art platform to localize and track objects
4	Embed the mechanism in devices like mobile phone
5	To support MSc, MTech, and PhD students working in relevant areas

6	To bridge the gender gap in the Machine Learning sector

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Survey on state-of-the-art mechanisms	First 6 months
2	Developing event camera-based methods	First 6 months
3	Implement efficient method to identify and track high speed objects, and then implement a mobile APP	Last 6 months
4	Establishing research collaborations with the other laboratories and institutes within the country and abroad	Around the year
5	Supporting M.Sc, M.Tech, and PhD students working in the domain of Machine Learning	Around the year
6	To provide internship opportunities in Machine Learning to students from various institutes and colleges	Around the year
7	To develop an APP for mobile application	Around the year

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Space localization, furnishing, and setting up the Development Centre.	2024-25
2	Recruitment of project personnel and procurement of the necessary hardware	2024-25
3	Locate the high-speed objects using event camera	2024-25
4	Development of the mobile application	2024-25
5	Test the applicability of the APP	2024-25

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	State-of-the-art Next Generation identification of the moving objects with very high speed
2	Collaboration with the premier ML research laboratories and industries
3	Indian/Foreign research students can be attracted to the state-of-the-art facility
4	Research publications and patents
5	Generating manpower with high technical skills in ML R&D
6	Empowering women software developers

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Survey on state-of-the-art mechanisms The existing work on event-based cameras to detect and track moving objects is a fascinating topic in Machine Learning. A detailed survey of the state-of-the-art methods is essential to understand the current literature to detect fast motions. It will also help to identify a set of open areas to progress the research in this area.

2	Developing event camera-based methods Event-based cameras are essential nowadays to detect fast motions. Developing one such method will be accepted by the machine learning research community. Therefore, our next target is to develop existing algorithms that perform highly accurately.
3	Implement efficient method to identify and track high speed objects, and then implement a mobile APP. In the next step, our target is to develop novel algorithms to detect high speed objects with high accuracy, real time, and consuming less computer resources. Thereafter, modify the algorithm in a way to generate a mobile APP for all mobile users.
4	Establishing research collaborations with the best laboratories and institutes within the country and abroad Best ML researchers and industry experts will be approached for their advice while developing the new fast object detection mechanism. Student exchange programs are also possible with foreign universities.
5	Supporting M.Sc, M.Tech, and PhD students working in the domain of Machine Learning Students will be able to work in the state-of-the-art ML development centre and get a chance to interact with the best researchers and ML practitioners.
6	To provide internship opportunities in Machine Learning to students from various institutes and colleges Undergraduate and postgraduate college students will be given internship opportunities in the proposed R&D centre. Students can visit the facility and learn from the experts.
7	To develop an APP for mobile application Using the purchased hardware equipment and the software items proposed to be developed, we will create a mobile APP for all mobile users. This facility can be extended later to give service to critical sector organizations.

Financial Outlay

Sl No	**School of Computer Science & Engineering (SoCSE)**	**Financial Outlay (Rs in Lakhs)**
1	Infrastructures- Setting up of lab, Hardware, Software and Computing	20.00
2	Research & Development Expenses	110.00
3	Faculty Cost	22.00
4	Course & Other Expenses	46.00
5	Overhead Charges	22.00
	Total	**220.00**

Component No. 3

School of Digital Sciences (SoDS)

New/Continuing/Spillover : Continuing

Type of Scheme : State Plan Scheme

Financial Outlay : Rs. 120 lakhs

Objective / Physical Target

To provide the critical meeting ground for people to learn the subject, interact with world class experts, collaborations, organized and regulated access to federated data, information, and computational resources, for knowledge creation, dissemination and applications to facilitate world-class education and bleeding edge research in the field of digital sciences and thereby empowering the society with updated skills and knowledge.

- To cater to the demand of trained human resources in the areas of STEM
- To foster advanced research, development and innovation in frontier areas of Digital Sciences.
- To encourage and motivate student community to take up the future challenges f the growing IT industry.
- To promote innovations and entrepreneurship ecosystem in social innovations and commercialize research outcomes.

Research Centers under School of Digital Sciences (SoDS)

A. Centre for Data Analytics & Advanced Informatics (CDAAI)

1. Objective:

Sl No	Objectives (2024-25)
1	Extension of Lab facilities for Data Analytics and Bigdata
2	R&D work in the area of data analytics
3	Continuation of work in 2024-25
4	Conduct short courses, seminars etc

2. Outcome of the Scheme: Outcome (2024-25)

Sl No	Objectives	Outcome
1	HR Development	MSc courses are running
2	Improvement lab facilities	University added new resources
3	Modification of existing course	Did

3. Detailed Description of the Activities for the year (2024-25)

Sl. No.	Description
1.	Continuing the current MSc computer science & data analytics courses
2.	Apply data analytics in different domains for knowledge discovery
3.	R&D in the areas of data analytics, chemistry and physics
4.	Integrating AI methods with computational sciences

4. Planned Activities (2024-25)

Sl. No.	Planned Activities (Physical Target)	Units
1	Human resource generation	150
2	Employment generation	10-20
3	Enhancement of lab facilities	1

5. Project Phasing

Sl No	Project Phasing	Year
1	Recruitment of manpower	2025
2	R&D	2025-25
3	Procurement of CADD and other softwares	2024
4	HR generation	2024-25

6. Objective and physical progress for the year (2023-24):

Sl No	Objectives (2023-24)	Physical Progress (2023-24)
1	Human resource development	MSc courses are running DUK
2	Enhancing Data data analytics facilities at DUK for new courses	Established labs
3	R & D in the areas relevant to the state	Published journal article as an end result – 5 Nos
4	Information dissemination by short courses, seminars etc.	Nil
5	Suggesting new policies using Data Analytics	Under Progress

B. Centre for Affective and Neurocomputing (CAN)

1. Objectives (2024-25)

Sl No	Objectives
1	Build a computational model to study the effects of ultrasound neuromodulation on certain central nervous system neurons.
2	Conduct pre-clinical studies of a medical device prototype for emergency

	autotransfusion
3	Develop the prototype of a medical device to prevent catheterization associated urethral injuries.
4	Continue the development of computational models of affective adaptation that can predict emotion responses to affective stimuli under various situations

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Computer-based emotion research to assist mental healthcare specialists and to continue to develop computational emotion models for use in affectively intelligent systems	
2	Computer-based brain research to assist treatment of addiction and mental disorders	
3	Medical and assistive device development	

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1.	Establishment of workshop facilities	2024-25
2.	R&D Development of computational models for human emotion dynamics	2024-25
3.	Development of computational models of the CNS neurons and its applications	2024-25
4.	Development of medical/assistive devices tailored for resource constrained situations	2024-25

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	Development of a computational models of human emotion dynamics with potential applications in mental healthcare, surveillance systems, human-computer interaction, robotics, games, virtual reality training and anywhere affectively intelligent systems are required.
2	Development of computational models of CNS neurons to study how ultrasonic neuromodulation can be used to develop better treatments for depression, alcoholism, pathological impulsivity and other addictions and mental disorders.
3	Development of the next level prototype of an autotransfusion device making use of pre-clinical trial data.
4.	Development of the first prototype of a device to prevent catheterization associated urethral injuries.

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Computer-based emotion research to assist mental healthcare specialists and to develop computational emotion models for use in affectively intelligent systems

2	Computer-based brain research to assist treatment of addiction and mental disorders
3	Multiple Medical and assistive device development

6. Physical Progress

Sl No	Objectives	Physical achievements of each resource person and cumulative achievements.
1	Complete a computational neuroscience study on the effects of inward rectifying potassium channel current inactivation on the calcium dynamics of Nucleus Accumbens Medium Spiny Neurons.	The study is completed. Manuscript under preparation to submit to a journal.
2	Complete a preliminary computational neuroscience study on the effects of ultrasound neuromodulation on certain central nervous system neurons.	Computational modeling is still in progress
3	Develop an improved prototype of the medical device for emergency autotransfusion.	Completed. Applied for patent.
4	Complete the development of a computational model of affective adaptation that can predict emotion responses to anticipated and experienced self-relevant events.	Completed. Manuscript for submitting to a journal to be prepared.

C. Centre for BioAI (C-BioAI)

1. Objective :

Sl No	Objectives (2024-25)
1	Developments on Next Generation Sequencing
2	Continuing course on BioAI with multiple specializations
3	Design and development of novel drug targets various diseases
4	AI-based studies on Proteins & Genes
5	Short-term courses BioAI-related areas

2. Outcome of the Scheme:

Sl No	Outcome (2023-24)

1	Publications : 1
2	Development of Human Resources : 1
3	Enhance computational power of digital university : University provided
4	Wet-lab for drug design : Not yet done
5	Design of new materials for anti-cancer drug discovery: In progress

3. Detailed Description of the Activities for the year (2024-25)

Sl. No.	*Description*
1.	Continuing the current MSc Data Analytics &BioAI
2.	Add more specializations to MSc course such as Agri, Health etc
3.	R&D in the areas of computer-aided drug design, BioNLP and BioIR
4.	Integrating AI methods in CADD

4. Planned Activities (2024-25)

Sl. No.	Planned Activities (Physical Target)	Units
1	Human resource generation	20
2	Employment generation	5
3	Enhancement of lab facilities	1
4	Starting new specialization in BioAI	1

5. Project Phasing

Sl No	Project Phasing	Year
1	Recruitment of manpower	2024
2	R&D	2024-25
3	Procurement of CADD and other softwares	2024
4	HR generation	2024-25

6. Objective and physical progress for the year (2022-23):

Sl No	*Objectives (2022-23)*	*Physical Progress (2022-23)*
1	Human resource development	Started a new course in MSc Data Analytics &BioAI and admitted 20 students
2	Enhancing biocomputing facilities at DUK for new courses	Procurement of machines is in progress.
3	R & D in the areas relevant to the state such as medicines against viral diseases	Developed novel drug lead for covid using AI techniques and published the paper in an internationally reputed courses
4	Information dissemination by short courses, seminars etc.	Nil
5	Design of anti-cancer & Anti-diabetes medicines	Published about 5 journal articles in internationally reputed journals

D. Centre for Agri-Informatics (CAI)

1. Objective:

2. Outcome of the Scheme:

Sl No	Objectives (2024-25)
1	To create the adequate human resource and talents in the area of Digital Agri Sciences
2	To enhance Digital and AI in agri analytics facilities at DUK to augment the new courses
3	To initiate the Research and Development in the area of Digital Agri Sciences
4	To initiate a short courses, seminars, workshops in the areas of Digital Agri Sicnces etc.
5	To pilot the development and testing of Sensor & IoT based applications in Agriculture and build smart agriculture applications

3. Detailed

Sl No	Outcomes (2024-25)
1	Trained man power and talent pool in the area of Digital Agri Sciences and AI applications in Agriculture to meet the requirements for 4th Industrial revolution and increase agriculture output of the state
2	To augment and support agricultural production
3	Provide on demand advisory support to Government and other stake holders

Description of the Activities for the year (2024-25)

4. Planned Activities (2024-25)

Sl No	Detailed Description of activates during the year (2024-25)
1	Developing Big data based applications in agriculture sciences
2	Starting short Courses in Agri AI: This course is a bridge course for those who are already having basic knowledge in specific domains and bridge their knowledge with data analytics and AI
3	Start a new lab specific to Digital Agri Sciences and Agri AI
4	R & D: AI applications in different domains of agriculture applications and smart agriculture
5	E-course materials: Development of e-course materials in the area of digital agri-sciences
6	Seminar /Workshops: Intended for researchers and academicians, professionals and farmers
7	Short term courses: aiming working professionals to upgrade their skill sets in the related area

Sl No	Planned Activities (Physical Target)	Units (2024-25)
1	To start activities with emphasis on Applications of Digital Sciences in Agriculture	2
2	To procure relevant infrastructure to support the activities	1
3	To design Design and Development of prototypes in AI applications in Agriculture	2
4	To initiate the design of short course	1
5	To provide research and development support for Government funded project using AI applications in Agriculture	2

5. Project Phasing

Sl No	Project phasing	Year (2024-25)
1	Starting Digital /computational and Analytical facility for Digital AI lab	Phase I
2	Research development in Digital Agri Sciences	Phase I & II
3	E-course materials	Phase III
4	Seminar Workshops	Phase IV
5	Short term courses	Phase IV
6	Supporting Govt. with Data analytics AI & Machine Learning	Phase V

E. Centre for Scientific Computing- Pathological Human Heart Simulations

1. Objectives (2024-25)

Sl No	Objectives
1.	Real-time simulation of cardiac electromechanics is challenging due to computational constraints. Our First Objective is to develop an algorithm based on Deep-Learning, that minimizes the computational resource requirements.
2.	Validation of the initial results
3.	Collaborate with a subject matter expert (cardiologist) to Gather the patient-specific data for simulation by considering all the Ethical and Privacy Concerns.

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units

1.	Implementation of the GenEObased solver for the hyper-elastic material in DUNE.	2
2.	Implementation of the Physics Informed Neural Network (PINNs) for hyper-elastic material	3
3.	Get the data/parameters for the case under the study	3
4.	Simulation of the pathological heart over a test geometry.	4

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Implementation of efficient solvers for Electro-Mechanical Coupling including Physics informed Neural Network in HPCs.	2024-2025
2	Validating the initial results using benchmark problems	2024-2025
3	Collaboration with a cardiologist to get the patient specific data	2025-2026
4	Creating an AI based software to generate finite element mesh from the CT scan image of the heart	2025-2026
5	Developing and deploying a software to simulate the functionality of a patient's heart under various daily life situations	2025-2026

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	Understand and analyze the risk of cardiac arrest among the patients with virus induced myocarditis using simulation of cardiac electromechanics.
2	Primary version of an artificial intelligence (deep learning) based software to perform simulation of human heart electrophysiology (cardiovascular system).

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1.	Implementing a GenEO-based solver for hyper-elastic materials in DUNE involves formulating the problem, linearizing it, constructing the system matrix, developing the GenEO preconditioner, integrating it with a linear solver, validating the implementation, and documenting it for wider use in scientific and engineering simulations involving hyperelastic materials.

2.	implementing PINNs for hyper-elastic materials involves formulating the problem, collecting data, designing and training a neural network architecture, defining a suitable loss function, and validating the model. PINNs offer a promising approach for solving complex material behavior problems while incorporating physical principles into the learning process.
3.	Perform sensitivity analyses to understand how variations in parameters affect simulation outcomes. This can help identify critical factors contributing to the pathological heart condition. Collecting accurate data and parameters is crucial for realistic simulations of pathological hearts. It allows researchers and clinicians to gain insights into the condition, evaluate potential treatments, and enhance our understanding of cardiovascular diseases.

Financial Outlay		
Sl No	School of Digital Science	Amount (Rs in Lakhs)
1	Infrastructure- setting up of Labs, Hardware, software, Computing etc	10.00
2	Research & Development Expenses	60.00
3	Faculty Cost	12.00
4	Course & Other Expenses	26.00
5	Overhead Charges	12.00
	Total	**120.00**

Component 4

School of Digital Humanities and Liberal Arts (SoDiHLA)

1. New/Continuing/Spillover : Continuing
2. Type of the Scheme : State Plan Scheme
3. Financial Outlay : Rs. 100 Lakhs
4. Objective/Physical Target

The School of Digital Humanities and Liberal Arts (DiHLA) at KUDSIT will focus on research related to digital culture and society and will explore the use of advanced technology-related methods in humanities research. In current times, cultural artefacts are increasingly available in digitised or born-digital form and computing power, which has grown exponentially over the last several decades, is more accessible than ever. The activities at the Centre would focus on the exploration and use of digital tools, analytical techniques and technology to explore humanistic questions and solving business related issues. The DiHLA will have its own academic and research programs in areas such as in Digital Law, Digital Pedagogy, Computational Social Science, e-Governance, management science, entrepreneurship, innovation, etc. The school will also collaborate with other schools of KUDSIT for supporting interdisciplinary programs of KUDSIT that have a humanities/social science component.

- To cater to the demand of trained human resoTo promote and influence the informed and critical uses of digital technology and computational approaches in social sciences, art, literature, history, area studies, linguistics, media, management and other disciplines of the humanities.
- To promote multidisciplinary domains of research in the social sciences that connect sociology, humanities, law economics, management, governance, policy, education and related disciplines with technical innovations in mathematics, statistics, and computer science.
- To bring together students and faculty from within various centers of KUDSIT as well as researchers and community members to explore the crossroads of the humanities and computing. To encourage and motivate student community to take up the future challenges of the growing IT industry
- To enable researchers and students to adapt computational and computer-aided methods to access, analyze, sequence, and present social and cultural artefacts in innovative ways.
- To engage with wider community of researchers, academics and practitioners for initiating, developing and sharing ideas to address and influence various emerging digital policy challenges
- To generate new and relevant knowledge through original research, and intervening through direct engagement with the civil society and communities.

Research Centers under School of Digital Humanities and Liberal Arts

A. Centre for Democratizing AI: Promoting to build AI Solutions by non-technical, domain experts [CDAI]

1. Objectives (2024-25)

Sl No	Objectives

1	Setting up the AI platform, configuring it on a GPU server, and building a core team to work on this platform.
2	Identifying real-life use cases and developing AI solutions using the AI platform
3	Introduce AI and ML courses to non-tech batches such as PGDeG, MBA batches and others
4	Conduct mass training to enable the creation of no-code AI solutions

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Installation and Setting up the AI platform, configuring it on a GPU server, and building a core team to work on this platform.	4
2	Identifying real-life use cases and developing AI solutions using the AI platform	2
3	Introduce AI and ML courses to non-tech batches such as PGDeG, MBA batches and others	2
4	Conduct mass training to enable the creation of no-code AI solutions	2

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Installation and Setting up the AI platform, configuring it on a GPU server, and building a core team to work on this platform.	2024
2	Identifying real-life use cases and developing AI solutions using the AI platform	2024
3	Introduce AI and ML courses to non-tech batches such as PGDeG, MBA batches and others	2024
4	Conduct mass training to enable the creation of no-code AI solutions	2025

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	Successful installation and configuration of the AI platform on a GPU server.
2	Formation of a proficient core team capable of working effectively with the AI platform.
3	Development of practical AI solutions for real-life use cases.
4	Introduction of AI and ML courses to non-technical batches, expanding knowledge and skills.

5	Achievement of mass training goals, enabling the creation of no-code AI solutions by a wider audience.
	Here are 5 possible outcomes based on the mentioned objectives:

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Installation and Setting up the AI platform, configuring it on a GPU server, and building a core team to work on this platform. Our primary objective is to ensure the successful installation and setup of the AI platform, including its seamless configuration on a GPU server. Additionally, we are dedicated to building a proficient core team that will spearhead initiatives involving this platform. This comprehensive approach aims to create a robust foundation for harnessing the power of artificial intelligence, enabling us to address real-world challenges and opportunities effectively. With a well-equipped team and optimized infrastructure, we are poised to achieve significant milestones in the field of AI and machine learning.
2	Identifying real-life use cases and developing AI solutions using the AI platform One of our primary objectives is to actively engage in identifying real-life use cases where AI can make a meaningful impact. We are dedicated to harnessing the capabilities of the AI platform to develop innovative AI solutions that address these real-world challenges. By identifying and solving practical problems, we aim to demonstrate the tangible benefits of AI technology and contribute to its broader adoption across various domains and industries.
3	Introduce AI and ML courses to non-tech batches such as PGDeG, MBA batches and others The initiative to introduce AI and ML courses to non-technical batches, including PGDeG, MBA batches, and other diverse groups, reflects our commitment to democratizing access to cutting-edge technology. By offering these courses to a wider range of students, we aim to equip them with valuable skills that are increasingly relevant in today's data-driven world. These courses will provide a solid foundation in AI and ML, empowering students from various backgrounds to harness the potential of these transformative technologies and apply them in their respective fields of study and future careers.
4	Conduct mass training to enable the creation of no-code AI solutions The objective of conducting mass training is to empower a broad spectrum of individuals, irrespective of their technical background, with the skills and knowledge required to create AI solutions without the need for complex coding. Through these training sessions, participants will gain hands-on experience in using user-friendly AI tools and platforms, equipping them to

	harness the potential of artificial intelligence in their respective domains. This initiative aims to democratize AI and make it accessible to a wider audience, fostering innovation and problem-solving across diverse sectors.

B. Centre for the Women Tech Innovators (CWTI)

1. Objectives (2024-25)

Sl No	Objectives
1.	Increased Enrollment: Train 800 women in soft skills and entrepreneurial skills, welcoming more participants from diverse backgrounds.
2.	Advanced Technology Training: Offer specialized training in emerging technologies relevant to entrepreneurship, such as artificial intelligence, blockchain, or data analytics.
3.	International Collaborations: Explore collaborations with international organizations for knowledge exchange and exposure to global entrepreneurial trends.
4.	Online Entrepreneurship Platform: Launch an online platform to showcase and support women-owned businesses, facilitating e-commerce and marketing opportunities.
5.	Mentorship Expansion: Expand the mentorship program by recruiting a wider pool of mentors from various industries and regions.
6.	Long-Term Impact Assessment: Initiate a long-term assessment to track the success and sustainability of women-led businesses born out of the program.

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target
1.	Expanded Training Workshops: Conduct a series of training workshops for women entrepreneurs, covering advanced entrepreneurial strategies, digital marketing, and tech-driven business models.
2.	Emerging Technology Seminars: Organize seminars and seminars on emerging technologies, bringing in experts to explain how they can be applied in entrepreneurial ventures.
3.	International Webinars: Host international webinars featuring successful women entrepreneurs and business leaders, offering global insights and networking opportunities.
4.	Online Entrepreneurship Platform Launch: Launch a dedicated online platform where women entrepreneurs can showcase and sell their products or services, with marketing and e-commerce support.
5.	Annual Women in Tech and Business Conference: Host a conference bringing together women entrepreneurs, tech professionals, and investors to foster networking and collaboration.
6.	Tech Innovation Challenge: Organize a tech innovation challenge encouraging women to develop innovative solutions or products.
7.	Mentorship Expansion: Expand the mentorship program with a focus on pairing women entrepreneurs with mentors who have expertise in technology-driven businesses.

8.	Impact Assessment Survey: Conduct a comprehensive impact assessment survey to collect feedback from participants and measure the long-term success of women-led businesses.

3. Physical Target

Sl No	Objectives
1	Train 500 women in soft skills and entrepreneurial skills with at least 85% reporting improved skills.
2	Expand digital literacy training to reach 300 women with 95% demonstrating proficiency.
3	Organize six technology-driven entrepreneurial workshops.
4	Increase the digital networking and mentorship platform membership to 200 active members.
5	Train 500 women in soft skills and entrepreneurial skills with at least 85% reporting improved skills.
6	Expand digital literacy training to reach 300 women with 95% demonstrating proficiency.
7	On track to train 700 women in soft skills and entrepreneurial skills with a high improvement rate.
8	Expanding digital literacy training with positive proficiency rates.
9	Planning six technology-driven entrepreneurial workshops.
10	Aim to reach 300 active members on the digital networking and mentorship platform

4. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1.	Phase 1: Project Launch and Foundation Building (2023) Objectives: Establish project infrastructure and team. Develop the curriculum and training materials. Identify and secure funding sources. Identify target participants and partners. Planned Activities: Formation of project team and roles. Curriculum development and refinement. Initial fundraising and partnership outreach. Participant recruitment and needs assessment. Launch project website and social media presence.	2023
2.	Phase 2: Implementation and Skills Training (2023-2024) Objectives: Provide initial soft skills and entrepreneurial training to the first cohort. Begin integrating technological training elements. Evaluate the effectiveness of the curriculum and training methods. Strengthen partnerships with local organizations. Planned Activities:	2023-2024

	Commence soft skills and entrepreneurial training workshops. Introduction of basic technological training modules. Ongoing participant assessments and feedback. Collaborative workshops with partner organizations. Monitoring and reporting of participant progress.	
3.	Phase 3: Expansion and Technology Integration (2024-2025) Objectives: Scale up the project to reach a wider audience. Deepen technological training components. Host technology-focused entrepreneurship events. Foster a supportive online community. Planned Activities: Increase the number of training workshops. Introduce advanced technology modules. Organize technology-driven entrepreneurship events. Launch an online community platform for participants. Explore partnerships with tech companies for resources.	2024-2025
4.	Phase 4: Sustainability and Impact Assessment (2025-2026) Objectives: Ensure the project's sustainability and long-term impact. Conduct comprehensive impact assessments. Expand the mentorship program. Explore revenue-generation strategies. Planned Activities: Develop a sustainability plan, including potential funding sources. Conduct a thorough impact assessment survey. Expand the mentorship program with a focus on technology-driven businesses. Explore revenue-generating opportunities, such as e-commerce support services. Share success stories and lessons learned with the broader community.	2025-2026

7. Outcome of the Project (2024-25)

Sl No	Outcome
1	Enhanced Soft Skills: Improved communication, leadership, time management, and problem-solving skills.
2	Entrepreneurial Skills Development: Comprehensive knowledge in business planning, financial management, marketing, and legal requirements.
3	Technological Proficiency: Proficiency in digital tools and technologies for business growth.
4	Increased Entrepreneurial Activity: Establishment of new women-led businesses.
5	Economic Empowerment: Higher income generation and financial independence.
6	Networking and Collaboration: A supportive network of women entrepreneurs.
7	Technology-Driven Businesses: Integration of technology for innovation and competitiveness.

8	Long-Term Sustainability: Skills contributing to the sustainability of women-led businesses.
	Community Development: Economic growth and job creation in the community.

8. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Expansion of Participant Base: Objective: To reach and empower a larger number of women from diverse backgrounds, including rural areas and disadvantaged communities. Activities: • Conduct awareness campaigns and outreach programs in underrepresented areas to encourage participation. • Collaborate with local community organizations to identify and recruit women from marginalized groups. • Organize information sessions and webinars to introduce the project to potential participants.
2	Advanced Technology Training: Objective: To offer specialized training in emerging technologies relevant to entrepreneurship, such as artificial intelligence, blockchain, or data analytics. Activities: • Develop advanced technology training modules and curricula in collaboration with industry experts and tech professionals. • Organize hands-on workshops and hackathons focused on applying advanced technologies to real-world business challenges. • Facilitate guest lectures and webinars by tech innovators and leaders in emerging fields.
3	International Collaborations: Objective: To explore collaborations with international organizations for knowledge exchange and exposure to global entrepreneurial trends. Activities: • Establish partnerships with international women's empowerment organizations and educational institutions. • Facilitate cross-border knowledge sharing through virtual conferences, workshops, and collaborative projects. • Arrange study tours or exchange programs for select participants to gain international exposure.
4	Online Entrepreneurship Platform Launch: Objective: To create a dedicated online platform where women entrepreneurs can showcase and sell their products or services, with

	marketing and e-commerce support. Activities: Develop and launch a user-friendly online platform, including e-commerce features, business profiles, and marketing tools. Provide training and support to participants to help them create and manage their online business profiles. Promote the platform through digital marketing and social media to attract customers and investors.
5	Mentorship Expansion: Objective: To expand the mentorship program by recruiting a wider pool of mentors from various industries and regions. Activities: Identify and onboard experienced mentors with diverse expertise in entrepreneurship and technology. Facilitate mentor-mentee matching based on participants' specific needs and business goals. Organize regular mentorship sessions and track progress, offering guidance and support as needed.
6	Long-Term Impact Assessment: Objective: To initiate a long-term assessment to track the success and sustainability of women-led businesses born out of the program. Activities: Design and implement a comprehensive impact assessment survey to collect data on business growth, income levels, and participant satisfaction. Establish a long-term monitoring and evaluation framework to track the progress of women entrepreneurs over several years. Share impact assessment findings and success stories with stakeholders and the wider community to showcase the project's effectiveness.

C. Centre for Human Centric Innovation

1. Objectives (2024-25)

Sl No	Objectives
1	The proposed centre for human-centric innovation is envisaged to effectively include the society and the environment in the digital transformation process.

2	To propose innovative solutions that can repair and bridge this social shear are necessary to put society, environment, and humanity back into the civic equation.
3	To organise an international conference on the theme of human-centric innovation to bring together the best minds in this area from different parts of the world in an attempt to inform the future direction of the centre.
4	To facilitate auditing of digital technology initiatives of DUK to ensure sustainability and social inclusion.
5	To develop best practices for technology development to ensure human-centricity.
6	To design, organize and conduct training and awareness programs for promoting sustainability, inclusion, and human-centricity.

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Setting up the centre	2
2	Strengthening the team. Recruit five PhDs resources in areas related to sociology, climate change, ecology, sustainability, and digital technology	5
3	Procuring hardware and software and setting up the full-fledged centre	1
4	Collaborating with external experts/agencies.	2
5	Support and augment the academic community of KUDSIT to focus on human centric innovations.	2
6	Training and Awareness Programs	1
7	International Conference	1
8	Audit	1
9	Best Practices in technology management	1

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	To set up a facility at Technopark Campus To hire five PhDs in areas related to sociology, climate change,	2023-24

	ecology, sustainability, and digital technology. Develop human centric best practices. Organize an international conference. Support the academic community of KUDSIT for human centric innovative experiences.	
2	Collaborating with external experts/agencies, industries, academia and research institutions for developing innovative human centric solutions To offer training and certification in human centred innovations To create inspiring and engaging human centric learning environments for the academic community in the country.	2024-25

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	An international conference on the theme of human-centric innovation to bring together the best minds in this area from different parts of the world in an attempt to inform the future direction of the centre.
2	Auditing of digital technology initiatives of DUK to ensure sustainability and social inclusion.
3	Development of best practices for technology development to ensure human-centricity.
4	Training and awareness programs for promoting sustainability, inclusion, and human-centricity.

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	The centre proposes the following activities in the first year. An international conference on the theme of human-centric innovation to bring together the best minds in this area from different parts of the world in an attempt to inform the future direction of the centre. Auditing of digital technology initiatives of DUK to ensure sustainability and social inclusion. Development of best practices for technology development to ensure human-centricity.

	Training and awareness programs for promoting sustainability, inclusion, and human-centricity.

Deliverables

The centre is envisioned as a catalyst for promoting human-centricity and the inclusion of social and natural environments in the digital transformation process so technological innovations are socially and environmentally sustainable. This is a long term objective. The key deliverables in the first year will include:

(a) Compilation of learnings from the conference and other seminars to be conducted by the centre

(b) Training / awareness modules for human-centric technology development in the digital era

(c) Compilation of best practices for human-centric technology development

(d) Develop a sense of purpose and commitment among all stakeholders adjusting to the changing demands of society

(e) Develop a human approach and sensibility in connecting with customers and developing human-centric metrics for digital transformation

(f) Auditing of digital technology initiatives of DUK to ensure sustainability, better human experiences and social inclusion.

(g) Proposing and triggering transformational change in each and every facet of value adding operations

D. Establishing Advanced Centre for Augmentation of Web based Multimedia streaming and content development Services and Consulting, to facilitate TEL for High Quality Education and Skill development (TEL4HQE)

1. Objective/Physical Target :

Sl No	Objectives
1	Establish Advanced Multimedia and TEL4HQE Centre in IIITM-K (Digital University) Technocity campus
2	Develop Web based – Multimedia video portal and archival system, Intelligent multimedia integration, video streaming, Responsive UI/UX , Research Virtual environments and platform, Interactive modules to facilitate e-learning systems.
3	Web Content Development and Pedagogy

4	Workshops and Seminars on Multimedia and TEL
5	Promote IIITM-K (Digital University) as a State nodal center to Facilitate inter-institutional utilization of multimedia lab and collaboration with DUK Schools

2. Project Phasing

Sl No	Phasing (2024-25)
1	Establish Advanced Multimedia and TEL4HQE Centre
2	Upgrade and Develop advanced modules for Web based Multimedia video streaming platforms, Responsive UI/UX, Interactive modules
3	Recruitment of Project / Research associates / developers / content
4	Procurement of Multimedia lab systems hardware and software
5	Content Development, Templates and Pedagogy and Intelligent multimedia integration
6	Creation of Multimedia learning objects prototype content
7	Consulting and Technical services to Govt. departments and agencies

3. outcome of the Scheme:

Sl No	Outcome
1	This scheme is required to establish an Advanced Centre for Multimedia and Technology Enhanced Learning (TEL4HQE) services to support the academic programmes of IIITM-K (Digital University) Technocity Campus. As part of broader theme TEL the centre will focus on development of Virtual Learning Environments, multimedia assisted learning frameworks and intelligent systems using advanced web standards and technologies.

4. Detailed Description of the Activities for the year

Sl No	Detailed Description of activities during the year
1.	Developed Multimedia portal repository framework for storage and retrieval of multimedia streaming content
2.	Develop automated capabilities for multimedia content management and distribution of lectures
3.	Technical consulting meeting to I-PRD for video archival system proposal, and developed proforma template for preliminary data collection

4.	Multimedia portal access for KSAAC Team to perform an initial security audit
5.	Deployed Recorded video lectures and ppt for 12 Hours Soft skills training programme in Google classroom for on-demand access for MSc. Computer Science steams 2022 batch
6.	Participated in ACM India Industry Bootcamp on Digital Experiences, 27-30 January 2022 organised by IIT-Madras, Accenture Labs
7.	Participated in meeting on Multimedia content generation models for SNOU by VC, June 2021
8.	Initiated JD for recruitment of project staff
9.	Facilitated on Live TCS iON project reviews, and seminars for 2022 batch
10.	Conducted Internet Technologies-2302, Sem. 3/AY2020 and Web Technologies-202 AY2021 / Sem. 2 sessions using IIITM-K Live classroom and Moodle LMS Live platform and pedagogy during Covid restrictions.
11.	Creation of Multimedia learning objects prototype content

Financial Outlay

Sl No	**School of Digital Humanities and Liberal Arts (SoDiHLA)**	**Financial Outlay (Rs in Lakhs)**
1	Infrastructures- Setting up of lab, Hardware, Software and Computing	5.00
2	Research & Development Expenses	50.00
3	Faculty Cost	10.00
4	Course & Other Expenses	25.00
5	Overhead Charges	10.00
	Total	**100.00**

Component 5

School of Informatics (SoI)

New/Continuing/Spillover : Continuing

Type of the Scheme : State Plan Scheme

Financial Outlay : 120 Lakhs

Physical Target / Objective

- Promote excellence in teaching and research with state-of-the-art infrastructure, through enhancing learning for all academic programs, including extra-curricular activities. The school is keen to advance scientific research and scholarship to an international level
- Promote the personal, social, academic and career growth of all students in a proactive manner to prepare and qualify them to be leaders in their chosen careers and professions The School provides proper environment that nurtures innovation, creativity, and the pursuit of knowledge
- Forge strategic partnerships with the local community, including the public service industry in order to be responsive to the socio-economic needs of the community through dedicated applied research.

Research Centers under the School of Informatics (SoI)

A. CV Raman Laboratory of Ecological Informatics (CVRLEI)

1. Objectives (2024-25)

Sl No	*Objectives (2024-25)*
1	To strengthen lab facilities and infrastructure to support academics and research
2	Continue Whetstone lab activities within CVRLEI. Facilitate training and knowledge transfer to empower the next generation of ecologists and informaticians, promoting the use of informatics in ecological research. on-demand, online/offline program on numerical skills for young professionals
3	Advocate for integrating informatics-driven ecological data into environmental policies, conservation strategies, and decision-making processes.
4	Organize conferences, workshops, and events
5	Foster collaboration with other reputed research labs

2. Outcome of the Scheme:

Sl No	Outcome (2024-25)
1	Improved lab infrastructure
2	Generation of skilled manpower through capacity development/public outreach programs: Training/Workshops/certification programs etc
3	Conference and workshops
4	Formation of Think-tank
5	Publications

3. Detailed Description of the Activities for the year (2024-25)

Sl. No.	*Description*
12.	Strengthening lab facilities and infrastructure to support academics and research involves activities aimed at enhancing the capabilities, efficiency, and safety of the laboratory environment. Purchase state-of-the-art laboratory equipment and instruments relevant to the research areas. Establish a regular maintenance schedule for equipment to ensure proper functioning and longevity. Evaluate and optimize lab spaces to maximize efficiency and safety.
13.	'Whetstone' Group within CVRLEI [Whetstone is a stone used for sharpening cutting tools]. will focus on providing training to sharpen the numerical and informatics skills for professionals The planned activities include: (a) An on-demand, online/offline program on numerical skills for young professionals (b) Build up a skilled workforce with analytical and practical capabilities in ecological research
14.	Advocating for integrating informatics-driven ecological data into environmental policies, conservation strategies, and decision-making processes involves a series of activities aimed at raising awareness, building support, and influencing relevant stakeholders.

15. Planned Activities (2024-25)

Sl. No.	Planned Activities (Physical Target)
1	Strengthening lab facilities and infrastructure – Procurement of lab equipment
2	Offer training and short term porgrams
3	Conferences/ webinars/ certified programs
4	Advocating for integrating informatics-driven ecological data into environmental policies
5	Initiate collaborations

16. Project Phasing

Sl No	Project Phasing	Year
1	Strengthening lab facilities and infrastructure – Procurement of lab equipment	Phase I-IV
2	Offer training and short-term programs	Phase I-IV
3	Conferences/ webinars/ certified programs	Phase III to IV
4	Advocating for integrating informatics-driven ecological data into environmental policies	Phase II-IV
5	Initiate collaborations	Phase I-IV

B. Sonic Data Analytics to characterize the state of ecosystems

1. Objectives (2024-25)

Sl No	*Objectives (2024-25)*
1	Sonic data analysis for characterization of plant physiology in water stress condition
2	Development of devices for acoustic sensing with respect to the objective 1
3	Analysis of acoustic data collected along the edge to the core gradient of the forest landscape.
4	Monitoring environmental changes using acoustic signatures

2. Outcome of the Scheme:

Sl No	Outcome (2024-25)
1	Development of an active acoustic sensor for the characterization of environmental stress conditions
2	Generation of an acoustic gradient map of the forest landscape
3	Increased understanding of the biotic response to environmental changes and habitat assessment and generation of data repository

3. Detailed Description of the Activities for the year (2024-25)

Sl. No.	*Description*
1	Global studies of plant phenology, distribution, stress, and crop health rely heavily on the spectral reflectance characteristic, often known as the spectral fingerprint. It has a resolution, atmospheric interference, and real-time data processing restrictions at the regional scale. The largely untapped sound monitoring approach can complement and supplement the light-based remote sensing of plant life. The proposed objectives of Sonic data analysis for the characterization of plant physiology in water stress condition considers the potential for acoustic fingerprinting to offer insight into the temporal dynamics of plant populations and ecosystem health. Sound is a signature attribute of a landscape. The sound over a landscape (soundscape) can broadly be discerned into biophony, geophony, and anthrophony. Sonic characterization thus posits as a means to understand and represent the state of landscape and is an indicator of biological diversity. Long-term recording can also help us trace species responses to the impacts of different environmental events and the recovery of species following the events. Acoustic data collected from the Automated Recording Devices (ARD)/ sensors from the edge forest to the core forest will be analysed for the

	generation of an acoustic gradient map.The following attributes such as elevation, canopy-cover estimate, slope, details of reported land use, and temperature and other landscape variables will be utilised for drawing inference. Acoustic indices such as Acoustic Complexity Index (ACI), Acoustic Diversity Index (ADI), Acoustic Evenness Index (AEI), Bioacoustics Index (BI), and Normalised Difference Soundscape Index (NDSI) will be calculated for the soundscape characterization of different locations within the forest. The threshold of anthropogenic sound level will be estimated using the normalized Power Spectral Density (PSD). The activity involves Identifying target ecosystems or areas for monitoring, considering factors like biodiversity, ecosystem health, and potential environmental threats, and Installing acoustic sensors in strategic locations within a selected site. Record audio data continuously or intermittently over extended periods, capturing the soundscape of the chosen environment. Supplementary environmental data, such as temperature, humidity, and weather conditions, will also be collected to contextualize acoustic recordings. Correlation of environmental variables with acoustic data will help to understand how environmental changes influence acoustic signatures. Data analysis includes analyzing audio data using signal processing techniques to extract meaningful information, such as species presence, behavior patterns, and changes in the soundscape. machine learning and statistical methods will be employed to process and interpret the vast dataset efficiently. Long-term monitoring efforts are required to capture changes in ecosystems over extended periods. Development algorithms or models to recognize specific acoustic patterns associated with environmental disturbances, including human activities, climate change impacts, and habitat alterations is also in consideration.

4. Planned Activities (2024-25)

Sl. No.	Planned Activities (Physical Target)
1	Experimental setup, Testing, and standardization
2	Development of active acoustic sensor
3	Analysis of acoustic data collected along the edge to the core gradient of the forest landscape.
4	Monitoring environmental changes using acoustic signatures – data collection

5. Project Phasing

Sl No	Project Phasing	Year
1	Experimental setup, Testing, and standardization	Phase I
2	Development of active acoustic sensor	Phase II

3	Analysis of acoustic data collected along the edge to the core gradient of the forest landscape.	Phase I and II
4	Monitoring environmental changes using acoustic signatures – data collection	Phase III and IV

C. Hyperspectral studies and nature-inspired grassroots-innovation for Sustainable Development

1. Objectives (2024-25)

Sl No	*Objectives (2024-25)*
1	Continuing hyperspectral data collection of plant samples and conducting radiometric studies
2	To initiate a database of the strength of plant materials and leverage sustainable products
3	Develop nature-based solutions for the restoration of degraded ecosystems.

2. Outcome of the Scheme:

Sl No	Outcome (2024-25)
1	Hyperspectral database of plant sample
2	A database of the physical strength of plant materials
3	Nature-based solutions for the restoration of degraded ecosystems.
4	Research publications and prototypes

3. Detailed Description of the Activities for the year (2023-24)

Sl. No.	*Description*
1.	Hyper spectral or radiometric analyses are a tried-and-true method for precisely representing many plant characteristics, such as floral colour, chlorophyll content, etc. By continuing to gather hyper spectral data from various plant samples and carrying out radiometric investigations to examine their spectral features, this project component seeks to broaden and improve our understanding of plant biodiversity and ecosystem health.
2.	Investigate the Strength of plant materials to identify the parts that can be utilized sustainably for developing eco-friendly bioinspired products/processes/ services. Establishing a comprehensive database that catalogues the strength and material characteristics of diverse plant-based materials is the prime objective of this project component. This database will act as a key resource for finding ways to use these resources in the creation of sustainable products.

3.	Discovering and implementing natural solutions that restore ecosystems that have been damaged or degraded by human activity or other external factors is the main objective of this project component. These tactics aim to increase biodiversity, ecosystem services, and ecological resilience. This includes ecological evaluation, developing naturally inspired solutions, putting those ideas into practise, monitoring them and managing them adaptively, including the community and educating them, as well as long-term sustainability.

4. Planned Activities (2023-24)

Sl. No.	Planned Activities (Physical Target)	Units
1	Continuation of Hyperspectral/ radiometric studies	
2	Initiating a database of the physical strength of plant materials	
3	Identify and prioritize ecosystems in need of restoration, considering factors like degradation severity, ecological significance, and potential for recovery Develop nature-based solutions for the restoration of degraded ecosystems.	

5. Project Phasing

Sl No	Project Phasing	Year
1	Hyperspectral database of plant sample	Phase I-IV
2	To initiate a database of the Strength of plant materials	Phase 1&II
3	Identify and prioritize ecosystems in need of restoration, considering factors like degradation severity, ecological significance, and potential for recovery Develop nature-based solutions for the restoration of degraded ecosystems.	Phase III &IV

D. Recent and projected warming of the Indian Ocean and the related ecological impact

1. Objectives (2024-25)

Sl No	Objectives
1	To assess the warming trends in the Indian Ocean under the climate change
2	To quantify when the warming signals can be reliably detected

3	To investigate the mechanisms of the Indian Ocean warming
4	To assess how the warming impacts the marine productivity and dissolved oxygen

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	To assess the warming trends in the Indian Ocean under the climate change	6 months
2	To quantify when the warming signals can be reliably detected	6 months
3	To investigate the mechanisms of the Indian Ocean warming	1 year
4	To assess how the warming impacts the marine productivity and dissolved oxygen	1 year

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Estimation of Indian Ocean warming trends and their detection time	2023-24
2	Ecological impacts of the Indian Ocean warming	2024-25

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	Estimation of time of emergence of climate-change induced warming signals
2	Understanding of processes driving the warming of the Indian Ocean
3	Potential impacts on the marine primary productivity and dissolved oxygen

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Downloading of climate change simulations and data processing
2	Development and implementation of algorithms to detect warming signals
3	Investigation of the underlying mechanisms
4	Ecological impacts

E. Developing Sustainable Solutions to Mitigate the Human-Wildlife Conflict –Ecological Informatics Approach

1. Objectives (2024-25)

Sl No	Objectives
1.	To evaluate, grade, and identify the gaps in mitigating human-wildlife conflict in the conflict hotspots of Kerala.
2.	To implement and test technology-based mitigation methods to resolve wildlife conflict
3.	Explore the scope of machine learning and technology and develop tools to identify and monitor individual wildlife involved in conflict frequently.
4.	Develop plans for sustainable means of livelihood, mainly focusing on alternative farming practices that wildlife avoid.

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1.	Field surveys, GIS, public participatory surveys, and case studies will be conducted multidimensionally to evaluate the status of human-wildlife interaction.	2
2.	Field surveys and public meetings will be conducted to evaluate the implemented conflict management systems.	2
3.	Individual animal profiling will be done to identify and monitor frequent conflict wildlife. In developing this tool, camera traps, direct photograph footprints, etc., will be considered.	1
4.	Based on the conflict type and wildlife involved, this plan will identify crop types and deterrents that keep wildlife away from human settlement. Knowledge of the cultivation, feasibility, and market is essential when introducing a new crop.	2
5	Data analysis and implimentation	

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Field surveys, GIS, public participatory surveys, and case studies to evaluate the status of human-wildlife interaction.	April -July 2024
2	Field surveys and public meetings to evaluate the implemented conflict management systems.	April-September 2024
3	Individual profiling for developing tools. Camera traps, direct photograph footprints etc	August 2024-Apil 2025 Likely to be extended next year
4	Develop plans for sustainable means of livelihood	December 2024–March 2025 (likely to be extended year)
5	Data Analysis and Implementationtion	September 2024-March 2026

4. Outcome of the Project (2024-25)

Sl No	Outcome
1.	Based on that, we will identify priority zones (High/low/mid conflict areas, Zoonoses potential, emerging hotspots) based on the type of human-wildlife interaction. A new index will be developed to figure out the conflict intensity level.
2.	A conflict monitoring and documentation system will be developed to gather the data from the conflict sites. This will replace existing primitive methods and make the process easier and paperless. This will also make conflict data readily available for the forest department, which will help policymakers to understand the on-ground real-time situations.
3.	Identifying and monitoring individual wildlife and groups frequently involved in the conflict is essential to develop management plans. Digital profiles for particular wildlife with identification features will be a cost-effective and non-invasive tool to monitor activities.
4.	Enhancing the quality of living is essential to elevate public tolerance towards wildlife. Implementing possible alternative sustainable livelihood and agricultural practices is the solution. Through this innovative effort, this study will primarily identify and replace the crops/products that wildlife targets. Also, provide training and market for producing the value-added products. Here, we adopt a potential village and develop successful models and prototypes, which can be implemented in other conflict-prone locations.

5. Detailed Description of the Activities for the Year (2024-25)

Human-wildlife conflict (HWC) is a pressing issue characterized by the escalating tension between human populations and wildlife species. Wildlife conflicts can impact human life, livelihoods, and the economy. These conflicts can directly affect human safety, disrupt livelihoods by damaging crops and livestock, impose economic costs through mitigation efforts, cause property damage, and lead to psychological stress. Additionally, they can hinder tourism, create conservation challenges, disrupt ecosystems, and strain social cohesion within communities. Managing these conflicts effectively requires comprehensive strategies that balance the needs of both human and wildlife populations, ensuring long-term sustainability and harmony.

Over the past decade, the human-wildlife conflict in Kerala has reached alarming levels. Shockingly, from 2011 to the present, 1,233 lives have been tragically lost to wild animal attacks. Furthermore, 2020-21 recorded a staggering 10,095 incidents of human-wildlife conflict in Kerala, surpassing the 2009-10 figures by more than threefold.

These statistics vividly illustrate the pressing need for immediate action. We implore the authorities to recognize the gravity of this situation and allocate resources, develop comprehensive strategies, and implement effective measures to mitigate this growing crisis. The safety and well-being of our citizens and the preservation of our wildlife demand our prompt and concerted efforts. To

overcome these challenges, this study will be conducted in selected areas of Kerala state with the following activities.

Our comprehensive study will employ a multi-faceted approach, including field surveys, Geographic Information Systems (GIS) analysis, public participatory surveys, and in-depth case studies. This holistic assessment aims to thoroughly examine the dynamics of human-wildlife interaction. One key component of our research involves individual animal profiling. We will meticulously identify and monitor wildlife species frequently conflicting with human populations. By gaining insights into the specific types of conflicts and the wildlife species involved, our plan will also pinpoint the crops most susceptible to damage.

Additionally, we will research and develop effective deterrents to safeguard these crops and keep wildlife away from human settlements. Furthermore, when considering the introduction of new crops, we understand the importance of a well-rounded approach. Therefore, our study will analyse cultivation methods, feasibility, and market potential to ensure the sustainable integration of new crops into the affected areas. Ultimately, we aim to promote harmonious coexistence between humans and wildlife while fostering economic sustainability.

F. Centre for sustainability studies at the School of Informatics

1. Objectives (2024-25)

Sl No	Objectives
1.	Advance interdisciplinary research in sustainability and promote sustainability education.
2.	Influence Policy and Practice and drive innovation and solutions
3.	Provide consultancy services in sustainability reporting.

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1.	Establishment of the center and recruitment of manpower	
2.	Identification of major sustainability challenges in Kerala and commencing interdisciplinary research	
3.	Development of courses and their delivery	
4.	Outreach activities and community engagement program	

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Establishment of the center and recruitment of manpower	April- June 2024
2	Identification of major sustainability challenges in Kerala and conducting interdisciplinary research	May 2024- March 2026
3	Development of courses and their delivery	July 2025- March

		2026
4	Outreach activities and community engagement programs	January 2025-March 2026

4. Outcome of the Project (2024-25)

Sl No	Outcome
1.	Advancement of sustainability research and knowledge.
2.	Empowerment of individuals and communities to adopt sustainable practices.
3.	Influence on policy and industry practices for a more sustainable future
4	Working papers and research articles

5. Detailed Description of the Activities for the Year (2024-25)

The vision is to establish a Center for Sustainability Studies (CSS) specifically focusing on promoting research, education, and advocacy within sustainability. The CSS aims to be a focal point for interdisciplinary cooperation, nurturing creative approaches to address global sustainability issues. Below are the details of the activities:

Advanced Interdisciplinary Research: Conduct cutting-edge interdisciplinary research on sustainability, addressing pressing environmental, social, and economic challenges of Kerala

Promote Sustainability Education: Develop educational programs, courses, and workshops that equip students, professionals, and the community with the knowledge and skills to promote sustainable practices. Promote outreach initiatives, public awareness campaigns, and community engagement programs to promote sustainability awareness and action at the local levels

Influence Policy and Practice: Use evidence-based policy research and advocacy to influence governments, organizations, and industries toward adopting sustainable policies, technologies, and practices.

Climate Action: Support climate mitigation and adaptation efforts through research, education, and advocacy, focusing on reducing greenhouse gas emissions and building climate resilience.

Sustainability reporting: Provide consultancy services for developing sustainability reports to different stakeholders.

Drive Innovation and Solutions: Serve as an incubator for innovative sustainability solutions, encouraging entrepreneurship and the development of sustainable technologies, products, and services.

Data and Metrics: Develop and maintain databases, metrics, and indicators to track progress and assess the impact of sustainability initiatives and policies.

G. Botanical Sentinel: *Advancing Endangered Plant Species Conservation in Kerala through Smart Technology Integration*

1. Objectives (2024-25)

Sl No	Objectives
1	Apply remote sensing and GIS technologies to identify and evaluate endangered plant species and their habitats across Kerala. Prioritize species based on conservation status and ecological importance.
2	Utilize state-of-the-art, technology-based habitat restoration techniques to support the survival and growth of threatened plant species, such as precision irrigation, soil sensors, and automated seed spreading systems.
3	Design and implement cutting-edge ex-site conservation facilities with advanced monitoring and data analytics capabilities to protect plant species outside their natural environments.
4	Use intelligent sensor networks, unmanned aerial vehicles (UAVs), and satellite data to track and survey critical plant habitat health and threats in real time.
5	Develop a mobile app and educational programs that use Artificial Reality (AR) and Virtual Reality (VR) to get people involved in plant protection, including residents, school kids, and tourists.
6	Establish a central database and analytics platform to collect, manage, and analyze data on endangered plant species, aiding knowledgeable conservation decisions.
7	Work with stakeholders to promote policies and regulations safeguarding threatened plant species and their ecosystems. Organize public awareness initiatives to encourage participation in conservation activities.

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Identification and Assessment: Conduct spatial (RS) surveys Analyze GIS data for endangered plant species mapping Prioritise plant species for conservation	2
2	Habitat restoration: Implement precision irrigation systems, Soil sensor deployment, Automated seed dispersal mechanisms	2
3	Ex-situ conservation: Establishment of botanical garden, Maintain seed banks, Monitor *ex-situ* plant populations	1
4	Monitoring and Surveillance: Deploy intelligent sensor networks,Utilize drones for aerial surveillance and analyze satellite imagery for habitat monitoring	2

5	Community engagement and Education: Develop a mobile app,Conduct interactive educational programs, Organize workshops for local communities	2
6	Data-driven decision-making: Establish a central database Analyse data for conservation decisions	
7	Policy Advocacy and Outreach: Collaborate with stakeholders Advocate for conservation policies, Conduct public awareness campaigns	

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Project Initiation and Technology Set up	Year 1
	1. Project Initiation • Formulate a project team and establish project governance. • Develop a detailed project plan and timeline. • Secure necessary permits and approvals. • Identify key stakeholders and partners.	Phase I (Month 1-3)
	2. Smart Technology Procurement and Database Setup • Procure essential innovative technologies (remote sensors, soil monitors, drones). • Develop a centralized database and analytics platform. • Train project personnel on smart technology usage.	Phase II (Month 4-6)
	3. Data Collection and Assessment • Conduct field surveys and data collection. • Analyze collected data to identify priority plant species and their distribution. • Prioritize conservation efforts based on assessment results.	Phase III (Month 7-12)
2	Habitat Restoration, Ex-situ Conservation, and Community Engagement	Year 2
	1. Habitat Restoration • Implement habitat restoration strategies, including precision irrigation and soil monitoring.	Phase IV(Month 13-19)

	• Deploy automated seed dispersal mechanisms. • Initiate habitat restoration in critical conservation areas.	
	1. Ex –situ Conservation • Establish botanical gardens and seed banks for ex-situ conservation. • Equip facilities with intelligent monitoring systems. • Begin monitoring ex-situ plant populations.	Phase V (Month 20-25)
3	Community Engagement and Education • Develop a mobile app for community reporting and education. • Conduct educational programs and workshops for local communities. • Engage local communities in conservation efforts.	Year 3 : Phase VI (Month 26 -36)

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	Establishment of Project Governance: The project will have a well-defined governance structure, including a project team, project manager, and stakeholder engagement plan. This ensures efficient project management and clear roles and responsibilities.
2	Comprehensive Project Plan: A detailed project plan, including timelines, milestones, and deliverables, will be developed. This plan will serve as a roadmap for the entire project, ensuring that activities are well-organized and that progress is tracked effectively.
3	Regulatory Approvals: Necessary permits and approvals for project activities will be obtained. Compliance with local environmental regulations and ethical considerations will be ensured.
4	Identification of Stakeholders: Key stakeholders and partners, including government agencies, local communities, and conservation organizations, will be identified and engaged in the project. This promotes collaboration and support throughout the project's duration.
5	Innovative Technology Procurement: Essential intelligent technologies, such as remote sensors, soil monitors, and drones, will be procured and ready for deployment. This safeguards that data collection and monitoring can embark in following stages.
6	Centralized database: This project will create and set up a centralised database and analytics platform. Utilizing this platform, data on threatened plant species and ecosystems will be managed and analysed.
7	Capacity Building and training: Training and capacity building will be provided to project team members using smart technologies and data

	collection methods. This gets the team ready for actual implementation in the phases that follow.
8	Data Collection starting phase: Data collection will start, with a focus on identifying and classifying endangered plant species, determining their distribution, and accumulating basic information for prioritisation.

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Project Initiation (Months 1-3) Team formulation: Create a diversified team of experts in project management, conservation biology, technology, and community participation to form the project team. Team members should be given roles and duties. Project Governance Establishment: Create a framework for project governance that outlines the decision-making procedures, communication rules, and reporting frameworks. Establish clear lines of responsibility and authority. Project Planning: Construct a complete project plan that shapes the project's objectives, limitations, and schedule. Choose significant outcomes and checkpoints for each step. Permits and Approvals: Determine and secure the appropriate permissions for project activities, assuring compliance with all state and local regulations. For data collection and conservation, approval is required. Stakeholder Identification: Identify key players, including regional communities, environmental organisations, and educational institutions, and engage with them. Form partnerships and alliances to help with project implementation.
2	Smart Technology Procurement and Database Setup (Months 4-6) Analyze the project's technology requirements meticulously, considering the utilization of drones, remote sensors, and soil monitors. Create a procurement strategy based on the needs discovered. Procuring smart technologies: Obtain the identified smart technologies while ensuring they abide to the project's requirements and specifications. Equipment sourcing, contract negotiations, and delivery management all fall under this category. Development of a Centralised Database and Analytics Platform: Work with a technology company or development team to build a central database and analytics platform. Set up the platform to accept information on plant species that are in danger of extinction and the ecosystems they require.

	Training Programme: Establish an initiative to train stakeholders and project staff in collecting data and using cutting-edge technologies. Training sessions must to go over how to use and maintain the new technologies.
3	Data Collection and Assessment (Months 7-12) Survey Design: Identifying endangered plant species, determining their distribution, and obtaining baseline data require the design of surveys and data gathering techniques Field Surveys: Deploy field teams to survey targeted conservation areas. Gather information on plant species, habitat characteristics, and any dangers.. Data Analysis: Create processes for handling and analyzing the gathered data, using statistical and geographic information system (GIS) tools to identify priority species and places for conservation. Prioritization: Prioritise endangered plant species and habitats for conservation throughout the subsequent project phases based on the analysis findings. Make a preliminary list of the species and regions that require urgent attention.

Financial Outlay

Sl No	**School of Informatics (SoI)**	**Financial Outlay (Rs in Lacs)**
1	Infrastructures- Setting up of lab, Hardware, Software and Computing	25.00
2	Research & Development Expenses	41.00
3	Faculty Cost	12.00
4	Course & Other Expenses	30.00
5	Overhead Charges	12.00
	Total	**120.00**

Component 6

School of Electronics System and Automation (SoEA)

New/Continuing/Spill over	:	Continuing
Type of the Scheme	:	State Plan Scheme
Financial Outlay	:	Rs 160 Lakhs
Objective/Physical Target	:	

- The SoE is an Engineering school that focuses mainly on applied research and innovation in Electronic Systems. The SoE aims to be international from its work environment to professional practice and offer intellectual freedom to grow. All the faculty in the school are considered intellectual equals irrespective of the stage of career.

- The SoE will place quality ahead of all the other parameters: a. The SoE places merit and quality ahead of equal opportunities principles. Although it will follow all the national guidelines and requirements where necessary, it will focus on the quality. b. It is expected that faculty members will attain high standards in research, teaching and services.

- The communications within the school aims to be transparent and fast. Being a digital university, all documentations to communications are expected to be in digital forms.

- SoE believes in a student-centered education. The students are expected to be internationally competitive and be highly disciplined in academic matters.

- SoE encourages internationalization of its education and research activities in all levels. It envisions collaborative programs and encourages faculty to build programs that benefit the Indian society.

- SoE will follow best practices from around the world and will update its strategies every year to be competitive nationally and internationally in all its endeavors.

- SoE encourages all its faculty to commercialize, productize, perform social innovations and patent research.

- SoE sets high priority to industry-academic collaborations and international research collaborations.

- SoE programs and activities shall follow at the minimum the relevant university guidelines and those required by regulatory bodies. However, SoE shall set higher standards than prescribed by the university, in its educational programs, outreach, consulting and recruitment activities.

Research Centers under School of Electronics System and Automation

A. Electronics for Social Good (ESG) – Swadeshi Electronic Chips, IoT Systems and AI Robotics Products for Society 4.0

1. Objectives (2024-25)

Sl No	Objectives
1	Continue the development of high-end electronic circuit boards with ASICs/FPGAs and build socially relevant applications to assist differently abled individuals.
2	Establish an open framework for sharing analog and digital electronic designs with the public, fostering collaboration and innovation.
3	Organize another round of workshops and training programs for students and researchers, focusing on electronics product design and its application in social innovation.
4	Continue the social innovation contest to identify and support projects that leverage AI chips for positive societal impact.

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	1. Further research and development of advanced electronic circuit boards. 2. Ongoing integration of ASICs/FPGAs for improved performance. 3. Enhancing existing robotics solutions and creating new ones for the benefit of differently abled individuals. 4. Continuous improvement and adaptation of assistive technologies based on user feedback.	1
2	1. Expanding the library of open-source hardware designs. 2. Enhancing documentation and guidelines for	1

	users and contributors. 3. Promoting community engagement and contributions. 4. Exploring partnerships to broaden the reach of open hardware initiatives.	
3	1. Planning and executing seasonal training programs as per demand. 2. Updating curriculum to reflect the latest advancements in hardware technology. 3. Inviting expert trainers and instructors for up-to-date knowledge sharing. 4. Providing hands-on experience with hardware design and social innovation projects.	1
4	1. Hosting the AI chip design contest to solicit innovative ideas and projects. 2. Selecting and supporting winning teams, including training and mentorship. 3. Developing prototypes and refining selected projects. 4. Exploring opportunities for scaling successful prototypes into real-world solutions.	1

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	• Project Component 1 (Swadeshi AI Electronics and Robotics Program for Differently Abled): o Continue research and development of electronic circuit boards. o Review and enhance existing robotics solutions. • Project Component 2 (Open Hardware Libraries Development): o Expand the library of open-source hardware designs. o Review and update documentation and guidelines. • Project Component 3 (Annual Seasonal School on AI Hardware): o Plan and prepare for the first training program of the year. o Update curriculum and invite trainers. • Project Component 4 (AI Chip Design Contest for Social Innovations): o Launch the AI chip design contest for the year. o Begin the selection process for teams.	Year 1
2	• Project Component 1 (Swadeshi AI Electronics and	Year 2

	Robotics Program for Differently Abled): o Continue development of electronic circuit boards and robotics solutions. o Collect user feedback and make necessary adjustments. • Project Component 2 (Open Hardware Libraries Development): o Promote community engagement and contributions. o Explore potential partnerships. • Project Component 3 (Annual Seasonal School on AI Hardware): o Conduct the first training program. o Gather feedback for improvements. • Project Component 4 (AI Chip Design Contest for Social Innovations): o Select winning teams and provide training and mentorship..	
3	• Project Component 1 (Swadeshi AI Electronics and Robotics Program for Differently Abled): o Finalize electronic circuit boards and robotics solutions. o Prepare for pilot testing and deployment. • Project Component 2 (Open Hardware Libraries Development): o Continue to expand the open hardware library. • Project Component 3 (Annual Seasonal School on AI Hardware): o Plan and prepare for the second training program. • Project Component 4 (AI Chip Design Contest for Social Innovations): o Support winning teams in prototype development.	Year 3
4	• Project Component 1 (Swadeshi AI Electronics and Robotics Program for Differently Abled): o Begin pilot testing of assistive technologies. o Gather data for improvements. • Project Component 2 (Open Hardware Libraries Development): o Assess the impact of open hardware initiatives. • Project Component 3 (Annual Seasonal School on AI Hardware): o Conduct the second training program. o Evaluate the effectiveness of the seasonal school. • Project Component 4 (AI Chip Design Contest for Social Innovations):	Year 4

	○ Continue supporting teams in prototype development and refinement. ○ Evaluate the progress of social innovation projects.	

4. Outcome of the Project (2024-25)

Sl No	Outcome
1-4	1. Advanced Electronic Circuit Boards: The development of high-end electronic circuit boards with integrated ASICs/FPGAs results in cutting-edge hardware solutions with enhanced performance. 2. Enhanced Robotics Solutions: Existing robotics solutions are improved, and new ones are created to assist differently abled individuals, leading to a broader and more effective range of assistive technologies. 3. User-Centric Adaptations: Continuous improvement and adaptation of assistive technologies based on user feedback ensure that these technologies remain responsive to the specific needs and challenges faced by differently abled individuals. 4. Positive Social Impact: The application of advanced electronics and robotics to assist differently abled individuals can lead to improved quality of life, increased independence, and greater accessibility for this community.
5-9	5. Expanded Open Hardware Library: The library of open-source hardware designs is significantly expanded, offering a wide array of templates, circuit diagrams, and component libraries for various electronic applications. 6. User-Friendly Documentation: Comprehensive and up-to-date documentation and guidelines make it easy for users to access and utilize the open hardware library effectively. 7. Community Engagement: Increased community engagement and contributions foster a sense of collaboration and innovation within the open hardware community, resulting in a richer and more diverse collection of designs. 8. Partnerships and Outreach: Exploring partnerships with educational institutions and other organizations extends the reach and impact of the open hardware library, facilitating greater knowledge sharing and collaboration. 9. Promotion of Openness: The open hardware initiative promotes the principles of openness, transparency, and knowledge sharing, contributing to a culture of open innovation in the field of electronics.

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Swadeshi AI Electronics and Robotics Program for Differently Abled (2022): Objective: Continue the development of high-end electronic circuit boards with ASICs/FPGAs and build socially relevant applications to assist

	differently abled individuals.
	Activities:
	• Further Research and Development of Advanced Electronic Circuit Boards:
	  o This activity involves ongoing research and development efforts to create advanced electronic circuit boards. It includes designing, testing, and iterating upon circuit board designs to ensure they meet the specific needs of the project. The use of ASICs/FPGAs should be further explored to enhance the performance and capabilities of these circuit boards.
	• Ongoing Integration of ASICs/FPGAs for Improved Performance:
	  o The integration of ASICs/FPGAs is crucial to enhance the processing power and functionality of the electronic circuit boards. During this activity, engineers and developers will work on seamlessly integrating these specialized chips into the circuit boards, ensuring they are optimized for their intended applications.
	• Enhancing Existing Robotics Solutions and Creating New Ones:
	  o Building on the existing robotics solutions, this activity involves continuous improvement and expansion of the robotics portfolio. Engineers and designers should collaborate to enhance the capabilities of existing robots and develop new robotic solutions that address the unique needs and challenges faced by differently abled individuals.
	• Continuous Improvement and Adaptation of Assistive Technologies:
	  o This activity is dedicated to ensuring that assistive technologies are continually refined and adapted based on user feedback and evolving requirements. Regular user testing and feedback sessions should be conducted to identify areas for improvement and to ensure that these technologies remain user-centric.
	Open Hardware Libraries Development
	Objective: Sustain and expand the open framework for sharing analog and digital electronic designs with the public, enabling broader collaboration and innovation.
	Activities:
	• Expanding the Library of Open-Source Hardware Designs:
	  o In this activity, the focus is on expanding the collection of open-source hardware designs available to the public. This includes creating new design templates, circuit diagrams, and component libraries that cover a wide range of electronic applications.
	• Enhancing Documentation and Guidelines for Users and Contributors:
	  o To ensure that the open hardware library is accessible and user-friendly, thorough documentation and guidelines should be developed and continually updated. This documentation should help users understand how to use the designs and how to contribute their own designs to the library.

	• Promoting Community Engagement and Contributions:
	  o The success of open hardware initiatives relies on community involvement. Efforts should be made to promote the library within the open hardware and maker communities. Regular communication through forums, mailing lists, and social media can encourage users to contribute their designs and share their experiences.
	• Exploring Partnerships to Broaden the Reach:
	  o To expand the impact of the open hardware initiative, exploring partnerships with educational institutions, hardware manufacturers, and other organizations is essential. Collaborations can lead to increased awareness, resources, and a broader user base for the open hardware library.

2	Annual Seasonal School on AI Hardware:
	Objective: Organize workshops and training programs for students and researchers, focusing on electronics product design and its application in social innovation.
	Activities:
	• Planning and Execution of Seasonal Training Programs:
	  o This activity involves the planning, organization, and execution of seasonal training programs. Each program is designed to provide students and researchers with in-depth knowledge and practical skills in electronics product design and its application in social innovation.
	• Curriculum Development for Electronics Product Design:
	  o The development of a comprehensive curriculum is critical. It should cover various aspects of electronics product design, including hardware, software, and integration. The curriculum should also emphasize the application of these skills to address social challenges and drive innovation.
	• Inviting Expert Trainers and Instructors:
	  o To ensure the highest quality of education, expert trainers and instructors should be identified and invited. These individuals possess deep knowledge and experience in electronics, AI hardware, and social innovation. They play a pivotal role in delivering effective training sessions.
	• Providing Hands-on Experience with Hardware Design and Social Innovation Projects:
	  o Practical, hands-on experience is a cornerstone of the training programs. Participants engage in activities such as designing electronic circuits, developing hardware prototypes, and working on real-world social innovation projects. This practical experience helps them apply what they learn in a real context.
	
	AI Chip Design Contest for Social Innovations:
	Objective: Conduct a social innovation contest to identify and support projects that leverage AI chips for positive societal impact.
	Activities:
	• Launching a Contest to Solicit Innovative AI Chip-Based Ideas and

	Projects: o This activity involves the launch of a contest open to individuals and teams to submit innovative ideas and projects that leverage AI chips for addressing social challenges. Contest guidelines, submission criteria, and timelines are established and communicated. • Selection and Support of Winning Teams: o After the contest submissions are received, a rigorous selection process is conducted to identify the winning teams or projects. Criteria may include feasibility, potential for social impact, technical innovation, and scalability. Selected teams receive support in the form of funding, mentorship, and training. • Prototyping and Development of the Selected Projects: o The winning teams embark on the prototyping and development phase of their projects. This involves turning their ideas into functional prototypes, which may include the design and integration of AI chips. The teams are provided with the necessary resources, including access to hardware and software tools. • Evaluation and Potential Scaling of Successful Prototypes: o As prototypes are developed, they undergo rigorous evaluation to ensure they meet their intended objectives. Successful projects that demonstrate positive societal impact and technical feasibility are considered for scaling into real-world solutions. This may involve seeking additional funding, partnerships, and resources to bring these projects to a broader audience.

6. Physical Progress

Sl No	Objectives	Physical achievements of each resource person and cumulative achievements.
1	Continue the development of high-end electronic circuit boards with ASICs/FPGAs and build socially relevant applications to assist differently abled individuals.	Each resource are involved in the development of products. The project has successfully developed high-end electronic circuit boards powered by ASICs/FPGAs, offering superior processing capabilities for various applications.
2	Establish an open framework for sharing analog and digital electronic designs with the public, fostering collaboration and innovation.	Each resource are involved in the development of products.
3	Organize another round of workshops and training programs for students and researchers, focusing on electronics product design and its application in social	One dedicated person for outreach activities. Remaining in technical support role.

	innovation.	
4	Continue the social innovation contest to identify and support projects that leverage AI chips for positive societal impact.	One dedicated person for outreach activities. Remaining in technical support role.

B. Centre for Unconventional Computing (National Centre for Quantum Intelligence and Computation)

1. Objectives (2024-25)

Sl No	Objectives
1	To develop quantum architectures for efficiently implementing AI and neuromorphic algorithms.
2	To design and develop circuits and systems for building a quantum computer.
3	To develop hardware systems that efficiently implement various cryptoanalysis techniques capable of analyzing quantum-aware cryptography.
4	To evangelize quantum computing, quantum architectures, electronics, and cryogenic electronics through short-term courses and training programs.

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	1. Conduct a literature review to understand the state-of-the-art in quantum AI algorithms and architectures. 2. Design and simulate quantum circuits for AI and neuromorphic applications. 3. Implement and test quantum algorithms on available quantum hardware. 4. Optimize quantum architectures for specific AI tasks. 5. Collaborate with AI researchers to identify quantum-enhanced AI applications.	1
2	6. Study existing quantum computing hardware designs and principles. 7. Develop and test quantum gates and qubit	1

	control systems. 8. Design and fabricate superconducting qubit devices. 9. Collaborate with physicists and engineers to integrate quantum components. 10. Explore error correction techniques for quantum hardware.	
3	11. Analyze existing quantum cryptographic algorithms and vulnerabilities. 12. Design specialized hardware for quantum cryptoanalysis. 13. Conduct experiments to test the effectiveness of cryptoanalysis techniques. 14. Collaborate with cryptography experts to identify potential weaknesses. 15. Develop countermeasures and recommendations for quantum-secure cryptography.	1
4	16. Develop course content on quantum computing, electronics, and cryogenics. 17. Organize workshops and training programs for students and professionals. 18. Create online learning materials and resources. 19. Collaborate with educational institutions and industry partners. 20. Evaluate and refine course content based on feedback.	1

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	*Project Component 1: Quantum AI* • Objective: Lay the groundwork for quantum AI research. • Activities: Conduct a comprehensive literature review in quantum AI. Form a team of researchers and quantum experts. Secure initial funding and resources. • Outcome: Research team assembled, literature review completed. *Project Component 2: Quantum Electronics* • Objective: Begin foundational work on quantum hardware design. • Activities: In-depth study of quantum hardware principles. Initiate preliminary circuit design and simulations. Establish partnerships with relevant experts. • Outcome: Initial circuit designs and research partnerships. *Project Component 3: Quantum Cryptoanalysis*	Year 1

	• Objective: Set the stage for cryptoanalysis efforts. • Activities: Review quantum cryptographic algorithms and trends. Identify potential cryptoanalysis team members. Initial discussions with cryptography experts. • Outcome: Cryptoanalysis team formation and initial research. *Project Component 4: Quantum Computing Courses* • Objective: Develop foundational course content. • Activities: Begin course content development. Plan the structure of workshops and training programs. Create an outline for online resources. • Outcome: Course content development in progress.	
2	*Project Component 1: Quantum AI* • Objective: Advance quantum AI algorithms and architectures. • Activities: Design quantum circuits for AI and neuromorphic tasks. Begin quantum algorithm implementation and testing. Collaborate with AI researchers. • Outcome: Quantum circuits designed, initial algorithm implementations. *Project Component 2: Quantum Electronics* • Objective: Dive into quantum hardware development. • Activities: Continue circuit design and simulations. Experiment with qubit control systems. Explore error correction techniques. • Outcome: Progress in circuit design, early prototypes. • *Project Component 3: Quantum Cryptoanalysis* • Objective: Commence cryptoanalysis hardware development. • Activities: Design specialized cryptoanalysis hardware. Initiate cryptoanalysis experiments. Strengthen collaboration with cryptography experts. • Outcome: Hardware design underway, cryptoanalysis experiments initiated. *Project Component 4: Quantum Computing Courses* • Objective: Prepare for educational initiatives. • Activities: Finalize course content for initial modules. Plan and announce the first workshops. Develop the online learning platform.	Year 2

	• Outcome: Course content ready, workshops planned.	
3	*Project Component 1: Quantum AI* • Objective: Optimize quantum architectures for AI. • Activities: Focus on optimization and performance enhancements. Continue collaboration with AI experts. • Outcome: Optimized quantum architectures, ongoing research. *Project Component 2: Quantum Electronics* • Objective: Progress in quantum hardware development. • Activities: Refine circuit designs and components. Collaborate with experts for integration. • Outcome: Improved circuit designs, advanced prototypes. *Project Component 3: Quantum Cryptoanalysis* • Objective: Strengthen cryptoanalysis capabilities. • Activities: Execute cryptoanalysis experiments. Assess vulnerabilities in quantum-aware cryptography. Develop initial countermeasures. • Outcome: Enhanced cryptoanalysis techniques, initial recommendations. *Project Component 4: Quantum Computing Courses* • Objective: Launch educational programs. • Activities: Conduct the first series of workshops and training programs. Launch the online learning platform. • Outcome: Successful workshops, online platform live.	Year 3
4	*Project Component 1: Quantum AI* • Objective: Demonstrate quantum advantage. • Activities: Showcase quantum advantage in AI tasks. Publish research findings and advancements. • Outcome: Demonstrated quantum advantage, research publications. *Project Component 2: Quantum Electronics* • Objective: Prepare for scaling up. • Activities: Conduct thorough hardware testing. Plan for scalability and larger quantum systems. • Outcome: Refined hardware, scalability plan in place. • *Project Component 3: Quantum Cryptoanalysis*	Year 4

	• Objective: Strengthen quantum-resistant encryption. • Activities: Develop comprehensive recommendations. Collaborate with cryptography community. • Outcome: Detailed recommendations, contributions to encryption standards. *Project Component 4: Quantum Computing Courses* • Objective: Wider dissemination of knowledge. • Activities: Expand course offerings. Collaborate with more educational institutions and partners. • Outcome: Expanded course portfolio, increased awareness.	

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	• Efficient quantum architectures designed for AI and neuromorphic algorithms. • Research papers and publications detailing the findings and advancements in quantum AI. • Demonstrations showcasing quantum advantage for specific AI tasks, potentially providing solutions to complex problems at a faster rate than classical computers.
2	• Quantum circuits and systems suitable for building a quantum computer, tailored to the chosen qubit technology. • Prototypes of key quantum components, such as qubit gates and control systems. • Insights into error mitigation strategies, which are vital for scaling up quantum hardware.
3	• Hardware systems designed for efficient quantum cryptoanalysis, potentially revealing vulnerabilities in quantum-aware cryptographic systems. • Reports and documentation detailing the identified vulnerabilities and recommended security enhancements. • Contributions to the development of stronger quantum-resistant encryption methods.
4	• A well-rounded and accessible set of educational materials on quantum computing and related fields. • A trained workforce with expertise in quantum technologies. • Increased awareness and understanding of quantum computing within academic and professional communities.

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*

1	Project Component 1: Quantum AI *Objective:* The primary objective of this component is to advance the field of quantum computing by developing specialized quantum architectures that can efficiently implement artificial intelligence (AI) and neuromorphic algorithms. These architectures aim to harness the unique properties of quantum systems to accelerate AI computations. *Activities:* • Literature Review: Begin with an extensive literature review to understand the current state of quantum AI algorithms and architectures, including the most recent developments in the field. • Quantum Circuit Design: Design quantum circuits that can perform AI and neuromorphic tasks efficiently. Explore techniques like quantum gates and variational quantum circuits. • Implementation and Testing: Implement the designed quantum algorithms on available quantum hardware or simulators. This involves programming and debugging quantum code. • Optimization: Continuously optimize quantum architectures for specific AI tasks, focusing on reducing error rates, improving performance, and minimizing resource requirements. Collaboration: Collaborate with AI researchers to identify potential quantum-enhanced applications in various domains, such as optimization problems, machine learning, and natural language processing.
2	Project Component 2: Quantum Electronics *Objective:* This component aims to design and develop the necessary circuits and systems required for building a practical quantum computer. Quantum electronics is the foundation upon which quantum computation is built, and it involves the manipulation and control of quantum bits (qubits). *Activities:* • Study and Research: Start by studying existing quantum computing hardware designs and principles. This phase includes in-depth research into various qubit technologies, such as superconducting qubits, trapped ions, or topological qubits. • Circuit Design: Develop and test quantum gates and qubit control systems. This involves creating the physical components responsible for performing quantum operations on qubits. • Hardware Fabrication: Design and fabricate the actual qubit devices,

	ensuring they meet the specific requirements of the chosen quantum computing platform. • Integration: Collaborate with physicists and engineers to integrate quantum components into a coherent quantum computer system, which may include cryogenic cooling systems and qubit interconnects. • Error Correction: Explore error correction techniques and strategies for minimizing the impact of noise and errors in quantum hardware, which is essential for building reliable quantum computers.
3	Project Component 3: Quantum Cryptoanalysis *Objective:* This component focuses on developing specialized hardware systems capable of efficiently implementing various cryptoanalysis techniques. The goal is to assess the vulnerabilities of quantum-aware cryptography and strengthen security measures. *Activities:* • Cryptography Analysis: Analyze existing quantum cryptographic algorithms and identify potential vulnerabilities or weaknesses in their security models. • Hardware Design: Design dedicated hardware systems for efficient cryptoanalysis, considering the unique requirements and computational demands of breaking quantum-aware cryptography. • Experimentation: Conduct experiments to test the effectiveness of cryptoanalysis techniques on quantum-aware cryptographic schemes, such as post-quantum encryption algorithms. • Collaboration: Collaborate closely with cryptography experts to understand the latest developments in quantum-resistant encryption and to provide feedback on potential security risks. • Countermeasures: Develop recommendations and countermeasures to strengthen quantum-resistant encryption methods based on the insights gained through cryptoanalysis.
4	Project Component 4: Quantum Computing Courses *Objective:* The objective of this component is to disseminate knowledge and raise awareness about quantum computing, quantum architectures, electronics, and cryogenic electronics through educational programs and training

	initiatives. *Activities:* • Course Content Development: Create comprehensive course content that covers quantum computing fundamentals, quantum hardware, electronics, and cryogenic technologies. This content can include lectures, textbooks, and multimedia resources. • Workshops and Training Programs: Organize workshops, seminars, and short-term training programs for students, researchers, and professionals interested in quantum technologies. • Online Resources: Develop and maintain an online platform that hosts educational materials, tutorials, and resources related to quantum computing and its supporting technologies. • Collaboration: Collaborate with educational institutions, research organizations, and industry partners to expand the reach of quantum education initiatives. • Feedback and Improvement: Continuously evaluate and refine course content based on participant feedback to ensure the effectiveness of the educational programs.

6. Physical Progress

Sl No	Objectives	Physical achievements of each resource person and cumulative achievements.
1	To develop quantum architectures for efficiently implementing AI and neuromorphic algorithms.	Each resource is involved in the development of quantum hardware and algorithm. Quantum algorithms are developed. New recruits for building the inter-university centre.
2	To design and develop circuits and systems for building a quantum computer.	Same resources are used. As above
3	To develop hardware systems that efficiently implement various cryptoanalysis techniques capable of analyzing quantum-aware cryptography.	Each resource is involved in the development and exploration of hardware focused quantum research. Initial phase is to explore the implementation in actual quantum hardware.
4	To evangelize quantum computing, quantum architectures, electronics, and cryogenic electronics through short-term courses and training programs. And to develop it as an independent centre of excellence, with inter-university activities.	Same resources are used. As above

C. Smart sensors and systems for healthcare, security, and agriculture (Smart Sensors)

1. Objectives (2024-25)

Sl No	Objectives
1.	Engage in the development of cutting-edge physical sensors, biosensors, and sensors for environment quality monitoring
2.	Train candidates in the domain of sensor fabrication
3.	Enhance the laboratory facility for non-CMOS sensor fabrication
4.	Encourage product development activities in the sensor domain

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1.	Design and development of fringing field-based capacitive proximity sensors	1
2.	Design and development of humidity sensors	1
3.	Design and development of sensors to detect water pollutants	1
4.	Design and development of biosensors to detect plant pathogens	1

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1.		
2.	Procuring equipment, and consumables, and setting up a facility for the fabrication of physical sensors and biosensors	2023-24
3.	Hiring manpower to develop sensors	2023-24
4.	Design, and fabrication of sensors	2023-24
5.	calibration and benchmarking of sensors	2024-25
6.	TRL mapping of the sensors	2024-25

4. Outcome of the Project (2024-25)

Sl No	Outcome
1.	TRL 4 fringing field-based capacitive proximity sensors
2.	TRL 4 humidity sensors

3.	TRL 4 system prototype of a sensing system to detect water pollutants
4.	TRL 3 biosensors to detect plant pathogens

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Fringing field-based capacitive proximity sensors are ideal candidates for non-contact sensing due to their high sensitivity, immunity to environmental factors, low power consumption, insensitivity to material properties, ease of integration with electronics, etc. Fringe field-based capacitive sensors with optimal geometric parameters will be realized as a part of this project. Design optimization is the first step in this research, where different configurations of fringe field-based capacitive sensors will be analyzed to figure out the optimal configuration. The device having optimal dimensions will be fabricated and tested to estimate the performance metrics and benchmark with simulation results.
2	Capacitive humidity sensors find numerous applications in healthcare, meteorology, environmental monitoring, industrial processes, etc. They typically have fast response, wide measurement range, and high accuracy and precision. Capacitive humidity sensors will be fabricated in such a way that it can be incorporated with the proximity sensors making it a multi-modal sensor.
3	Water pollution is one of the major challenges faced today. The pollutants in water affect aquatic life and pose major health hazards to human beings. It is essential to figure out the pollutants present in water and estimate their quantity. As a part of this project, sensors to detect water pollutants will be designed and developed. Material optimization to maximize the selectivity and sensitivity is the key research in this direction.
4	As the case of human beings, detecting pathogens affecting plants is vital to diagnose their disease conditions. Though PCR techniques exist to detect plant pathogens, such processes are laborious and uneconomical. In this part of the proposal, we aim to develop portable biosensors for plants that can be taken to the field to identify pathogens.

6. Physical progress (2022-23) & (2023-24):

Sl No	Objectives	Physical achievements of each resource person and cumulative

		achievements.
1	Develop the complete architecture of deep-neural accelerators by including the variabilities.	The design of the deep-neural accelerators is in progress.
2	The neural-PUF architecture implementation for ensuring hardware security	The design of the neural-PUF architecture is in progress. Upon successful completion of the design, the hardware implementation will be taken up.
3	Design of intelligent edge devices for fingerprint identification	Design and fabrication of intelligent fingerprint devices using graphene is in pro
4	Electronics system design and implementation of smart soil sensors for IoT applications.	A LoRaWAN system has been developed and is currently under use for IoT applications. IoT-enabled soil pH sensor is also developed.

D. Centre for Flexible/Wearable Electronic Devices

1. Objectives (2024-25)

Sl No	Objectives
1	Flexible/printable and Bio-Integrated Electronics: Pioneering the development of advance cutting-edge flexible and bio-integrated electronic materials, flexible substrates, and stretchable semiconductors that seamlessly integrate with the human body. This could involve creating electronic tattoos, wearable wireless electronic patches, smart textiles, implantable sensors, and biodegradable electronic components for biomedical and healthcare applications.
2	Advanced Micro/Nanoelectronics Design: Develop cutting-edge micro/nanoelectronics designs using advanced materials and fabrication techniques to create miniaturized, more powerful, and energy-efficient electronic devices for applications such as IoT, wearables, and smart systems.
3	Prototyping, Testing, and validation: self-powered electronic tattoos, wearable wireless electronic patches, and implantable sensors. Conduct integration testing for human body compatibility. Application specific research, Explore healthcare applications for practical use.
4	Sustainability and Eco-Friendly Design: Promote eco-conscious design principles and sustainable materials in the development of flexible electronics to reduce environmental impact, enhance recyclability, and create environmentally friendly electronic products.

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target
1	Flexible/printable and Bio-Integrated Electronics: Materials Research: advanced flexible/wearable and bio-integrated electronic materials. Advanced Microelectronics Design: high-performance materials selection, including nano electronic components. Develop miniaturized circuit designs. Employ state-of-the-art fabrication techniques. Validate and test electronic device functionality. Explore IoT and wearable integrations. Prototyping: self-powered electronic tattoos, wearable wireless electronic patches, and implantable sensors. Conduct integration testing for human body compatibility. Application specific research, Explore healthcare, food, pharmaceutical and environmental applications for practical use.

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Development of sustainable flexible/printable electronic materials and its bio-integration	2024-25
2	Advanced, miniaturized, flexible micro/nanoelectronics circuit design	2025-26
3	Fabrication of prototype, real time monitoring/testing, and validation	2026-27

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	Development of advanced, sustainable, flexible/biocompatible materials.
2	Fabrication of flexible/wearable electronic patches or tattoos
3	Tested and validated of flexible devices towards healthcare diagnostics
4	Application specific real time investigated

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Flexible/printable and Bio-Integrated Electronics: Materials Research: Investigate and develop advanced flexible and bio-integrated materials, such as bio-compatible polymers and biodegradable semiconductors. Prototyping: Create prototypes of electronic tattoos, wearable patches, smart textiles, implantable sensors, and biodegradable electronic components for medical and healthcare applications. Integration Testing: Conduct rigorous testing and integration trials to ensure seamless integration of electronic materials with the

	human body. Application-Specific Research: Explore specific applications, such as real-time health monitoring or drug delivery, to tailor designs for practical use cases.
2	Advanced Microelectronics Design: Materials Selection: Identify and select advanced materials, including nanoelectronic components, to achieve high-performance and energy-efficient designs. Circuit Design: Develop cutting-edge micro/nanoelectronic circuit designs to optimize performance and miniaturization. Fabrication Techniques: Utilize state-of-the-art fabrication methods, such as photolithography and thin-film deposition, to create miniaturized electronic devices. Testing and Validation: Implement comprehensive testing and validation processes to ensure the functionality and reliability of the electronic devices. IoT and Wearable Integration: Explore integration possibilities with IoT, wearables, and smart systems for practical applications.

E. Centre for Battery and Hydrogen Technology (CEBAH)

1. Objectives (2024-25)

Sl No	Objectives
1	Establishing a centre for battery and hydrogen technology (CEBAH) in DUK
2	Exploring and developing advanced materials for enhanced battery performance and green hydrogen production with safety and longevity.
3	Upgrading battery pack & cell connection system cases with sensor technology
4	Providing high-quality university education in the field of hydrogen, battery storage systems and electronic battery sensors to cultivate the next generation of experts and innovators

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Development of high energy density electrodes for sodium ion batteries	Energy density of ~360 Wh/kg
2	Scalable synthesis of Silicon based anodes from silica and demonstration of high-rate capability and stability in Li-ion coin cells	Stable capacity for 5000 cycles
3	Synthesizing and testing the cost-effective and efficient transition metal based electrocatalyst and photocatalyst powders for H2 production.	Efficiency (above 80 %) and stability (>1000 hours) with an aim to achieve 1 Nm3 h-1 of H2 gas with power

		consumption below 1 kWh/Nm3.
4	Fabrication of the necessary sensors for an EV battery pack & cell connection system	Current, temperature, pressure and water intrusion sensor

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Setting up labs for battery fabrication and testing, battery sensor fabrication and testing, hydrogen generation by electrolysis/photocatalysis.	2024
2	Focus on publications and patents	2025
3	Setting the stage for a pilot plant for prototype development in collaboration with industry	2026

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	Scalable and stable silicon-based anode materials for Li-ion battery from silica sand available in Kerala
2	Demonstration of high energy density electrodes for Na-ion battery
3	Development of Electronic battery sensor
4	Collaboration with industries focussed on energy generation and storage

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	The Indian government has set a target of generating 500 GW of renewable energy by 2030, which is five times the present capacity. Future renewable-energy technology will be mainly based on solar, and wind energy as a source installed at a very large scale in a remote area. This massive quantity of power will be either directly connected to grids by transmission line or will be transported in the form of batteries and H2 fuel. The batteries and H2 fuel can be directly used in electric and fuel-cell vehicles, respectively, while H2 can also be mixed with compressed natural gas (CNG) to improve efficiency and reduce pollution in the transport sector. To make this dream come even close to reality, it is imperative to manufacture the components of this renewable energy system in India under the “Make in India” campaign. Aligning with this, we have envisioned for the establishment of DUK centre for battery and hydrogen technology (CEBAH). It is dedicated to consolidating and advancing expertise in various fields, including physics, chemistry, material science, engineering and information technology, with a primary focus on interdisciplinary research and development of green hydrogen and battery storage systems and associated sensor technology. <u>Development of high energy density electrodes for sodium ion batteries</u> The sustainability issues and limited availability of lithium resources

	have underscored the need to explore alternative solutions for energy storage to meet the growing global energy demand. Sodium-ion batteries (NIBs) present a promising option due to their potential for affordability, safety, and scalability. These batteries utilize raw materials that can be sourced ethically and sustainably from abundant and cost-effective elements. Furthermore, NIBs can be stored and transported at zero volts, reducing shipping expenses and safety hazards, which enhances their potential for widespread commercial adoption. The primary challenge in the application of sodium-ion batteries lies is their low energy density. To address this issue, we propose the development of high-energy-density electrodes for sodium-ion batteries.
2	Scalable synthesis of Silicon based anodes from silica sand available in Kerala The demand for high-energy, high-power density, and high rate-capability lithium-ion batteries has increased for use in hybrid electric vehicles. The silicon nanostructure is a promising candidate for an anode of Li-ion batteries due to its high theoretical capacity. Here we propose the scalable synthesis of Si nanomaterial from natural silica sand and its modification with graphene or other conducting additives. The coastal area between Alappuzha and Aroor in Alappuzha District contain extensive deposits of silica sand. Such deposits can be utilized to synthesis silicon and subsequently fabricate high energy density anodes.
3	Synthesizing and testing the cost-effective and efficient transition metal based electrocatalyst/photocatalyst for H2 production Alkaline water electrolyzers (AWE) have been a key technology for large-scale hydrogen production and are capable of generating energy in MW range. Over the years, several industries have grown in manufacturing AWE for various applications, especially in UK, Europe and USA. However, in India, the technology of AWE is still in its infancy. The present-day AWE stacks consist of a number of electrolysis cells in bipolar configuration. Of all the stack components, the development of cathode and anode is the major research concern, as it governs the overall efficiency of the electrolyzer. Main objective is to develop of low-cost alkaline water electrolyser (AWE) stacks using transition-metal based electrocatalysts for facile incorporation in electrolyser setups.

F. Center for Biomedical Signal Processing (CBSP)

1. Objectives

Sl No	Objectives (2024-25)
1	Project component 1 Objectives: ● Development of deep learning architecture for Myocardial Infarction (Heart Attack) using Electrocardiogram (ECG) signals ● Implementation of machine learning architecture in IoT development

	boards using Python
2	Project component 2 Objectives: ● Development of machine learning architecture for Ventricular Tachycardia (VT) and Ventricular Fibrillation (VF) detection from ECG signals ● Implementation of machine learning architecture in IoT development boards using Python
3	Project component 3 Objectives: ● Development of machine learning architecture for aortic valve and mitral valve abnormality from PCG signal ● Implementation of machine learning architecture in IoT development boards using Python
4	Project component 4 Objectives: ● Consolidate the initial results and manuscript preparations for national / international conference publications. ● Consolidate the final results and manuscript preparations for national / international journal publications.

2. Physical Target (Unit):

Sl No	Planned Activities (Physical Target)	Units (2024-25)
1	Project component 1, Developing an Artificial Intelligence based Automated Screening for Myocardial Infarction (Heart Attack) using Electrocardiogram (ECG) signals	12 months
2	Project component 2, Developing an Artificial Intelligence based Ventricular Tachycardia (VT) and Ventricular Fibrillation (VF) Prediction using ECG signals	12 months
3	Project component 3, Developing an Artificial Intelligence based aortic valve and mitral valve abnormality using Phonocardiogram (PCG) signal	12 months
4	Project component 4, Consolidate the results and manuscript preparations for publications	12 months

3. Scheme/Project phasing:

Sl No	Phasing	Year (2022-23)
1	Project component 1, Phase 1a: Data collection, pre-processing and database preparation	2 months
2	Project component 1, Phase 1b: Development of deep learning architecture for Myocardial Infarction (Heart Attack) using Electrocardiogram (ECG) signals	4 months

3	Project component 1, Phase 1c: Implementation of machine learning architecture in internet of things (IoT) development boards using Python	6 months
4	Project component 2, Phase 2a: Data collection, pre-processing and database preparation	2 months
5	Project component 2, Phase 2b: Development of machine learning architecture for Ventricular Tachycardia (VT) and Ventricular Fibrillation (VF) detection from ECG signals	5 months
6	Project component 2, Phase 2c: Implementation of machine learning architecture in IoT development boards using Python	5 months
7	Project component 3, Phase 3a: Data collection, pre-processing and database preparation	4 months
8	Project component 3, Phase 3b: Development of machine learning architecture for aortic valve and mitral valve abnormality from PCG signal	4 months
9	Project component 3, Phase 3c: Implementation of machine learning architecture in IoT development boards using Python	4 months
10	Project component 4, Phase 4a: Study of state-of -the art artificial intelligence based heart abnormality identification work using ECG and PCG.	4 months
11	Project component 4, Phase 4b: Consolidate the final results and manuscript preparations for national / international journal publications.	8 months

4. Outcome of the Scheme

Sl No	Outcome (2024-25)
1	Portable AI enable Automated Screening system for Myocardial Infarction (Heart Attack) using Electrocardiogram (ECG) signals on IoT development boards
2	Portable AI enable Ventricular Tachycardia (VT) and Ventricular Fibrillation (VF) Prediction using ECG signals on IoT development boards
3	Portable AI enable aortic valve and mitral valve abnormality using PCG signal on IoT development boards
4	National / International Journal/Conference publications.

5. Detailed Description of the Proposed Activities

Sl No	Detailed Description of activities during the year (2024-25)
1	Project component 1, Developing an Artificial Intelligence based Automated Screening for Myocardial Infarction (Heart Attack) using ECG signals

	Developing an Artificial Intelligence (AI) based Automated Screening for Myocardial Infarction (Heart Attack) using ECG signals involves several key steps. First, a diverse and comprehensive dataset of ECG recordings, including both normal and MI cases, need to be collected. Next, the data is preprocessed, which includes cleaning, noise reduction, filtering, and feature extraction to prepare it for model training. A deep learning model, such as a Convolutional Neural Network (CNN) or Recurrent Neural Network (RNN), will be developed using Python and libraries like TensorFlow Lite. The model will be trained on the dataset to recognize patterns indicative of MI. Simultaneously, a user-friendly interface will be designed and developed for healthcare professionals to upload ECG data for automated screening. Model evaluation will be conducted to assess its accuracy, sensitivity, specificity, and other relevant performance metrics. Ethical considerations, including patient data privacy and regulatory compliance, are thoroughly addressed throughout the project. Finally, the AI-based MI screening system is deployed in a secure and scalable environment, and user training materials are provided to ensure effective utilization by healthcare professionals.
2	Project component 2, Developing an Artificial Intelligence based Ventricular Tachycardia (VT) and Ventricular Fibrillation (VF) Prediction using ECG signals First, a comprehensive dataset of ECG recordings, including cases of VT, VF, and normal rhythms, will be collected. Next, data preprocessing which includes noise reduction, filtering, and feature extraction to prepare the data for model training. A deep learning model, possibly a RNN or CNN, will be developed using Python and deep learning libraries like TensorFlow Lite. The model is trained on the dataset to recognize patterns and features associated with VT and VF. Thorough model evaluation is conducted, assessing accuracy, sensitivity, specificity, and other relevant performance metrics. Ethical considerations, such as patient data privacy and regulatory compliance, are strictly adhered to throughout the project. Finally, the AI-based VT and VF prediction system is deployed in a secure environment, ready to assist in early detection and intervention for life-threatening arrhythmias.
3	Project component 3, Developing an Artificial Intelligence based aortic valve and mitral valve abnormality using Phonocardiogram (PCG) signal Initially, a diverse PCG dataset, encompassing both normal and abnormal valve sounds, will be collected. The dataset undergoes preprocessing, including noise reduction, signal segmentation, and feature extraction to prepare it for model training. Subsequently, a machine learning or deep learning model, such as a CNN or RNN, will be developed utilizing Python and appropriate libraries like TensorFlow Lite. The model will be trained on the PCG dataset to recognize distinctive patterns and characteristics associated with aortic and mitral valve abnormalities. Rigorous model evaluation will be conducted, assessing accuracy, sensitivity, specificity, and other relevant performance metrics. Ethical considerations concerning patient data privacy and regulatory compliance are diligently addressed throughout the project. Finally, the AI-

	based Aortic Valve and Mitral Valve Abnormality Detection system will be deployed in a secure environment, poised to aid healthcare professionals in early diagnosis and intervention for valvular heart conditions.
4	Project component 4, Consolidate the results and manuscript preparations for publications: Despite the numerous advancements achieved through AI, the continued progress and practical implementation of deep neural networks face significant challenges due to their inherent black-box nature, characterized by a lack of interpretability and the demand for extensive training datasets. However, the adoption of a highly effective approach known as algorithm unrolling or unfolding offers a promising solution, bridging the gap between iterative algorithms widely used in signal processing and deep neural networks. Initially introduced to expedite the development of rapid neural network approximations for sparse coding, unrolling methods have gained substantial traction in recent times, garnering attention in both theoretical exploration and real-world applications. The increasing popularity of unrolled deep networks can be attributed to their potential in crafting efficient, high-performance, and interpretable network architectures, even when working with moderately sized training datasets. In light of these notable performance enhancements, our project aims to apply the concept of algorithm unrolling to the domain of biomedical signal processing. We intend to comprehensively explore the utilization of algorithm unrolling techniques across various facets of biomedical signal processing. Through an in-depth review of prior research, we endeavor to uncover the intricate connections between iterative algorithms and neural networks, presenting recent theoretical advancements in this context. Finally, we will engage in a discourse on the existing limitations of algorithm unrolling and propose potential avenues for future research in this dynamic field.

The project components 1, 2 and 3 contribute directly to this. The project specifically targets the applicants from SC/ST community, in training them and also help shape their career. The project components 1, 2, and 3 contribute directly to Women. The project specifically targets the applicants from SC/ST community, in training them and also help shape their career. While project component 1 and 2 also directly or indirectly will have benefiting the girls or women.

G. Center for Biomedical Imaging (CBI)

1. Objectives

Sl No	Objectives (2024-25)
1	Project component 1 Objectives:

	• Development of deep learning architecture for Diabetic Retinopathy detection from Fundus image • Implementation of deep learning model using the GPU programming in the python platform.
2	Project component 2 Objectives: • Development of deep learning architecture for AMD detection from Fundus image • Implementation of deep learning model using the GPU programming in the python platform.
3	Project component 3 Objectives: • Development of deep learning architecture for Glaucoma detection from Fundus image • Implementation of deep learning model using the GPU programming in the python platform.
4	Project component 4 Objectives: • Consolidate the initial results and manuscript preparations for national / international conference publications. • Consolidate the final results and manuscript preparations for national / international journal publications.

2. Physical Target (Unit):

Sl No	Planned Activities (Physical Target)	Units (2024-25)
1	Project component 1, Developing an Artificial Intelligence based Automated Screening for Diabetic Retinopathy (DR)	12 months
2	Project component 2, Developing an Artificial Intelligence based Age-Related Macular Degeneration (AMD) Prediction	12 months
3	Project component 3, Developing an Artificial Intelligence based Glaucoma Detection using Fundus Imaging	12 months
4	Project component 4, Consolidate the results and manuscript preparations for publications	12 months

3. Scheme/Project phasing:

Sl No	Phasing	Year (2022-23)
1	Project component 1, Phase 1a: Data collection, pre-processing and database preparation	2 months
2	Project component 1, Phase 1b:	4 months

	Development of deep learning architecture for Diabetic Retinopathy detection from Fundus image	
3	Project component 1, Phase 1c: Implementation of deep learning architecture in GP-GPU using Python	6 months
4	Project component 2, Phase 2a: Data collection, pre-processing and database preparation	2 months
5	Project component 2, Phase 2b: Development of deep learning architecture for AMD detection from Fundus image	5 months
6	Project component 2, Phase 2c: Implementation of deep learning architecture in GP-GPU using Python	5 months
7	Project component 3, Phase 3a: Data collection, pre-processing and database preparation	4 months
8	Project component 3, Phase 3b: Development of deep learning architecture for Glaucoma detection from Fundus image	4 months
9	Project component 3, Phase 3c: Implementation of deep learning architecture in GP-GPU using Python	4 months
10	Project component 4, Phase 4a: Study of state-of -the art artificial intelligence based Fundus image abnormality identification work.	4 months
11	Project component 4, Phase 4b: Consolidate the final results and manuscript preparations for national / international journal publications.	8 months

4. Outcome of the Scheme

Sl No	Outcome (2024-25)
1	AI enable system for Diabetic Retinopathy detection from Fundus image using the GPU programming
2	A deep learning based system for AMD detection from Fundus image using the GPU programming
3	AI enable system for Glaucoma detection from Fundus image using the GPU programming
4	National / International Journal/Conference publications.

5. Detailed Description of the Proposed Activities

Sl No	Detailed Description of activities during the year (2024-25)
1	Project component 1, Developing an Artificial Intelligence based Automated

	Screening for Diabetic Retinopathy (DR) Diabetic Retinopathy (DR) is a common complication of diabetes and a leading cause of vision loss. Timely diagnosis and intervention are crucial to prevent vision impairment or blindness among diabetic patients. This project aims to develop an AI-based automated screening system for DR using Python, which will analyze retinal fundus images and provide early detection of DR. The proposed system will significantly improve the efficiency of DR screening and contribute to better healthcare outcomes for diabetic patients.
2	Project component 2, Developing an Artificial Intelligence based Age-Related Macular Degeneration (AMD) Prediction Age-Related Macular Degeneration (AMD) is a progressive eye condition that primarily affects the elderly population, leading to severe vision impairment or blindness. Early detection and intervention are crucial for preventing irreversible damage. Traditional methods of diagnosis are time-consuming and may delay critical treatment decisions. This project proposes the development of an Artificial Intelligence-based AMD Prediction system using advanced machine learning techniques, which will analyze retinal images and predict the risk of AMD progression. The current methods of AMD diagnosis are manual, subjective, and reliant on the expertise of healthcare professionals. There is a need for an automated system that can assist medical practitioners in early detection and risk prediction of AMD, enabling timely interventions to preserve patients' vision. The AI-Based AMD Prediction aims to significantly improve early detection and risk prediction of Age-Related Macular Degeneration, contributing to better healthcare outcomes and preserving patients' vision.
3	Project component 3, Developing an Artificial Intelligence based Glaucoma Detection using Fundus Imaging Timely diagnosis of glaucoma is challenging due to the lack of noticeable symptoms in its early stages. Traditional diagnostic methods require specialized equipment and expertise, making them less accessible in many healthcare settings. An AI-based solution can aid in early detection, improving patient outcomes. Glaucoma is a progressive eye disease that damages the optic nerve and can lead to irreversible vision loss. It often develops without noticeable symptoms until it's in an advanced stage. Early detection and treatment are essential to prevent vision impairment. The Artificial Intelligence-based Glaucoma Detection holds the potential to significantly improve the early diagnosis of glaucoma, thus preventing vision loss and enhancing patient care.
4	Project component 4, Consolidate the results and manuscript preparations for publications: Despite several gains of AI, future development and practical deployment of deep networks is hindered by their blackbox nature, i.e., lack of

	interpretability, and by the need for very large training sets. An efficient technique called algorithm unrolling or unfolding eliminates these issues with a concrete and systematic connection between iterative algorithms that are used widely in signal processing and deep neural networks. Unrolling methods were first proposed to develop fast neural network approximations for sparse coding. More recently, this direction has attracted enormous attention and is rapidly growing both in theoretic investigations and practical applications. The growing popularity of unrolled deep networks is due in part to their potential in developing efficient, high-performance and yet interpretable network architectures from reasonable size training sets. In the light of this improvement in performance, we plan to develop algorithm unrolling for fundus image processing. We extensively cover popular techniques for algorithm unrolling in various domains of fundus image processing including imaging, vision and recognition, etc. By reviewing previous works, we reveal the connections between iterative algorithms and neural networks and present recent theoretical results. Finally, we provide a discussion on current limitations of unrolling and suggest possible future research directions.

The project components 1, 2 and 3 contribute directly to sc/st. The project specifically targets the applicants from SC/ST community, in training them and also help shape their career.

The project components 1, 2, and 3 contribute directly to Women. The project specifically targets the applicants from SC/ST community, in training them and also help shape their career. While project component 1 and 2 also directly or indirectly will have benefiting the girls or women.

H. Centre for Intelligent Sensor Electronics and Applications (ISEA)

1. Objectives (2024-25)

Sl No	Objectives
1	Project Component 1: Intelligent Sensor Electronics Objectives: • Develop high-performance analog sensor electronics. • Improve the signal-to-noise ratio through low-noise amplifiers. • Implement advanced filtering techniques. Create trigger waveform generators for precise data capture.
2	Project Component 2: Intelligent Camera Sensors Objectives: • Develop an intelligent camera system for computer vision and robotics. • Implement features such as object recognition and tracking. • Ensure compatibility with various applications and platforms.

3	Project Component 3: Workshop and Training Program Objectives: • Conduct training programs on smart sensor electronics. • Educate participants on the use of intelligent camera sensors. • Disseminate knowledge on emerging sensor technologies.
4	

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	• Research and development of low-noise amplifiers. • Design and testing of higher-order filters. • Development of trigger waveform generation circuits. • Integration and testing of sensor electronics with existing systems. • Iterative refinement of designs based on testing results.	1
2	• Hardware and software design of the intelligent camera. • Integration of computer vision algorithms for object recognition. • Testing and calibration of the camera sensors. • Development of software interfaces for robotics applications. • Compatibility testing with different computer vision frameworks.	1
3	• Curriculum development for sensor electronics training. • Curriculum development for intelligent camera sensor training. • Organizing workshops and hands-on training sessions. • Inviting guest speakers and experts in the field. • Providing online resources and materials for self-study.	1
4		1

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Year 1: • Project Component 1, Intelligent Sensor Electronics: • Activities: • Research and development of low-noise amplifiers. • Design and testing of higher-order	Year 1

	filters. • Development of trigger waveform generation circuits. • Integration and testing of sensor electronics with existing systems. • Iterative refinement of designs based on testing results. • Outcomes: • High-quality analog sensor electronics with improved sensitivity. • Reduction in noise levels leading to enhanced data accuracy. • Implementation of advanced filtering for signal conditioning. • Reliable trigger waveform generators for data synchronization. • Documentation of designs and testing results for future reference. • Project Component 2, Intelligent Camera Sensors: • Activities: • Hardware and software design of the intelligent camera. • Integration of computer vision algorithms for object recognition. • Testing and calibration of the camera sensors. • Development of software interfaces for robotics applications. • Compatibility testing with different computer vision frameworks. • Outcomes: • Intelligent camera system capable of real-time object recognition. • Tracking functionality for moving objects in the camera's field of view. • A versatile camera system suitable for diverse applications. • Comprehensive documentation for ease of use and future development. • Project Component 3, Workshop and Training Program: • Activities: • Curriculum development for sensor electronics training. • Curriculum development for intelligent camera sensor training. • Organizing workshops and hands-on training sessions. • Inviting guest speakers and experts in the field. • Providing online resources and	

	materials for self-study.
	• Outcomes:
	  • Well-trained individuals in smart sensor electronics.
	  • Proficient users of intelligent camera sensors for computer vision.
	  • Increased awareness and knowledge of emerging sensor technologies.
	  • A network of professionals and enthusiasts in the field through workshops and collaborations.	

2	Year 2:
	• Project Component 1 (Continuation):
	  • Activities:
	  • Further optimization of sensor electronics based on feedback.
	  • Scaling up production or deployment of sensor electronics.
	  • Continuous monitoring and maintenance of deployed systems.
	  • Outcomes:
	  • Enhanced versions of sensor electronics based on real-world usage.
	  • Increased availability of reliable sensor electronics in applications.
	  • Maintenance and support infrastructure for deployed systems.
	• Project Component 2 (Continuation):
	  • Activities:
	  • Updates and improvements to the intelligent camera system.
	  • Feedback-driven enhancements to computer vision algorithms.
	  • Expanding compatibility and integration with other platforms.
	  • Outcomes:
	  • Improved intelligent camera system with added features.
	  • Better performance in object recognition and tracking.
	  • Increased adoption in various industries and applications.
	• Project Component 3 (Continuation):
	  • Activities:
	  • Conducting additional training sessions.
	  • Evolving the curriculum to incorporate new technologies.
	  • Building a community around sensor
		Year 2

	technology enthusiasts.
	• Outcomes:
	  • Ongoing education and skill development in the field.
	  • Adaptation to emerging sensor technologies.
	  • A growing and engaged community of professionals.	

3	Year 3:
	• Project Component 1 (Further Development):
	  • Activities:
	  • Exploration of advanced sensor technologies.
	  • Continuous improvement based on user feedback.
	  • Expansion into new application areas.
	  • Outcomes:
	  • Adoption of cutting-edge sensor technologies.
	  • Enhanced product lines and broader market reach.
	• Project Component 2 (Advanced Features):
	  • Activities:
	  • Research and implementation of advanced computer vision capabilities.
	  • Integration with machine learning algorithms.
	  • Collaboration with industry partners for real-world use cases.
	  • Outcomes:
	  • A highly sophisticated intelligent camera system.
	  • Stronger capabilities in machine learning-based vision applications.
	  • Industry recognition and partnerships.
	• Project Component 3 (Extended Training):
	  • Activities:
	  • Specialized training programs on emerging sensor technologies.
	  • Expansion of online resources and materials.
	  • Hosting international conferences or symposiums.
	  • Outcomes:
	  • Expertise in the latest sensor innovations.
	  • A global network of sensor
		Year 3

	technology enthusiasts. • A repository of knowledge and research contributions.	
4	Year 4: • Project Component 1 (Consolidation): • Activities: • Standardization of sensor electronics for broader adoption. • Focus on sustainability and eco-friendly designs. • Outcomes: • Widely accepted and environmentally conscious sensor products. • Project Component 2 (Market Dominance): • Activities: • Market penetration strategies. • Support for custom integrations and applications. • Continuous product updates and customer support. • Outcomes: • Dominance in the intelligent camera sensor market. • High customer satisfaction and loyalty. • Project Component 3 (Global Influence): • Activities: • Collaborative research with international institutions. • Hosting large-scale international events. • Outcomes: • Pioneering research contributions to the sensor field. • Strong global influence in sensor technology education.	Year 4

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	Year 1 Outcomes: • Project Component 1, Intelligent Sensor Electronics: • Development of high-quality analog sensor electronics with improved sensitivity. • Reduction in noise levels leading to enhanced data accuracy. • Implementation of advanced filtering for signal conditioning. • Reliable trigger waveform generators for data synchronization. • Project Component 2, Intelligent Camera Sensors: • Creation of an intelligent camera system capable of real-time

	object recognition. • Integration of tracking functionality for moving objects. • Delivery of a versatile camera system suitable for diverse applications. • Provision of comprehensive documentation for ease of use. • Project Component 3, Workshop and Training Program: • Successful launch of training programs in smart sensor electronics. • Proficiency in the use of intelligent camera sensors for computer vision. • Increased awareness and knowledge of emerging sensor technologies. • Establishment of a network of professionals and enthusiasts.
2	Year 2 Outcomes: • Project Component 1 (Continuation): • Enhanced versions of sensor electronics based on real-world usage. • Increased availability of reliable sensor electronics in applications. • Maintenance and support infrastructure for deployed systems. • Project Component 2 (Continuation): • Improved intelligent camera system with added features. • Better performance in object recognition and tracking. • Increased adoption in various industries and applications. • Project Component 3 (Continuation): • Ongoing education and skill development in the field. • Adaptation to emerging sensor technologies. • A growing and engaged community of professionals.
3	Year 3 Outcomes: • Project Component 1 (Further Development): • Adoption of cutting-edge sensor technologies. • Enhanced product lines and broader market reach. • Project Component 2 (Advanced Features): • A highly sophisticated intelligent camera system. • Stronger capabilities in machine learning-based vision applications. • Industry recognition and partnerships. • Project Component 3 (Extended Training): • Expertise in the latest sensor innovations. • A global network of sensor technology enthusiasts. • A repository of knowledge and research contributions. •
4	Year 4 Outcomes: • Project Component 1 (Consolidation): • Widely accepted and environmentally conscious sensor products. • Project Component 2 (Market Dominance): • Dominance in the intelligent camera sensor market. • High customer satisfaction and loyalty. • Project Component 3 (Global Influence): • Pioneering research contributions to the sensor field.

	• Strong global influence in sensor technology education.

5. detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Project Component 1: Intelligent Sensor Electronics • Objective: The primary objective of this project component is to develop advanced analog sensor electronics to enhance data acquisition and precision in various applications. This includes low-noise amplifiers, higher-order filters, and trigger waveform generators. • Activities: o Low-Noise Amplifiers (LNAs): Research and develop low-noise amplifiers to boost the sensitivity of sensors, ensuring that even faint signals can be accurately captured. o Higher-Order Filters: Design and test higher-order filters to remove unwanted noise and interference from sensor signals, resulting in cleaner and more accurate data. o Trigger Waveform Generators: Develop trigger waveform generation circuits to precisely control when data is captured, enabling synchronized data acquisition in applications such as robotics and scientific instrumentation. o Integration and Testing: Integrate the sensor electronics into existing systems and thoroughly test their performance to validate their functionality and reliability. o Iterative Refinement: Continuously refine the designs based on real-world testing and user feedback, ensuring that the sensor electronics meet the highest standards of quality and accuracy. • Outcomes: o Development of high-quality analog sensor electronics with improved sensitivity. o Reduction in noise levels, leading to enhanced data accuracy. o Implementation of advanced filtering techniques for signal conditioning. o Reliable trigger waveform generators for precise data capture. o Comprehensive documentation of designs and testing results for future reference.
2	Project Component 2: Intelligent Camera Sensors • Objective: The main objective of this project component is to create intelligent camera sensors tailored for computer vision and robotics applications, incorporating advanced features like object recognition and tracking. • Activities: o Hardware and Software Design: Develop both the hardware and software components of intelligent camera sensors, focusing on efficient data processing and real-time capabilities. o Computer Vision Algorithms: Integrate computer vision algorithms for object recognition, tracking, and other intelligent features to enable the camera to understand and

	interact with its environment. o Testing and Calibration: Rigorously test and calibrate the camera sensors to ensure accurate and consistent performance across different scenarios. o Software Interfaces: Create software interfaces and APIs that enable seamless integration of the camera sensors into various robotics and computer vision applications. o Compatibility Testing: Ensure compatibility with a range of computer vision frameworks and platforms to maximize usability. • Outcomes: o Development of an intelligent camera system capable of real-time object recognition and tracking. o Enhanced software interfaces and APIs for easy integration into robotics and computer vision applications. o Broad compatibility with various computer vision frameworks. o Comprehensive documentation for users and developers.
3	Project Component 3: Workshop and Training Program • Objective: The primary objective of this project component is to provide education and training programs on smart sensor electronics and technologies to disseminate knowledge and expertise. • Activities: o Curriculum Development: Develop comprehensive training curricula for smart sensor electronics and intelligent camera sensors. o Workshops and Training Sessions: Organize workshops, training sessions, and hands-on labs to educate participants in both theory and practical applications. o Guest Speakers and Experts: Invite guest speakers and subject matter experts to share insights and real-world experiences in the field. o Online Resources: Provide online resources, educational materials, and video tutorials to facilitate self-study and continuous learning. • Outcomes: o Well-trained individuals with expertise in smart sensor electronics and intelligent camera sensors. o Proficient users of advanced sensor technologies for various applications. o Increased awareness and knowledge of emerging sensor technologies. o A community of professionals and enthusiasts in the field through workshops and collaborations.

6. Physical Progress

Sl No	Objectives	Physical achievements of each resource person and cumulative achievements.

1	Project Component 1: Intelligent Sensor Electronics Objectives: • Develop high-performance analog sensor electronics. • Improve the signal-to-noise ratio through low-noise amplifiers. • Implement advanced filtering techniques. • Create trigger waveform generators for precise data capture.	Analog sensor electronics, low-noise amplifiers, higher-order filters, trigger waveform generators
2	Project Component 2: Intelligent Camera Sensors Objectives: • Develop an intelligent camera system for computer vision and robotics. • Implement features such as object recognition and tracking. • Ensure compatibility with various applications and platforms.	Intelligent camera systems, computer vision, robotics
3	Project Component 3: Workshop and Training Program Objectives: • Conduct training programs on smart sensor electronics. • Educate participants on the use of intelligent camera sensors. • Disseminate knowledge on emerging sensor technologies.	Education and training programs, sensor technologies

Financial Outlay

Sl No	**School of Electronics Systems & Automations (SoE)**	**Financial Outlay (Rs in Lakhs)**
1	Infrastructures- Setting up of lab, Hardware, Software and Computing	15.00
2	Research & Development Expenses	73.00
3	Faculty Cost	16.00
4	Course & Other Expenses	40.00
5	Overhead Charges	16.00
	Total	**160.00**

Component.7

Kerala Blockchain Academy

1. New/Continuing/Spillover : Continuing
2. Type of the Scheme : State Plan Scheme
3. Financial Outlay : Rs 100 lakhs
4. Objectives (2024-25)

Sl No	Objectives
1	Build/Enhance the infrastructure for • CBDC/Central Bank tokens-related training and experiments of DeFi • Content creation using new age technologies
2	Develop the human resource and platform for building and hosting content in the Web 3 ecosystem. Develop at least two more solutions for socially relevant problems.
3	Design, develop and launch certification programs in the new areas of Web 3, and CBDC. Develop and publish PG Level Textbooks in Blockchain Technologies.
4	Develop and launch executive education programs in the areas Blockchain Networks, CBDC and Web 3.

5. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Build/Enhance the infrastructure for • CBDC/Central Bank tokens-related training and experiments in DeFi • Content creation using new age technologies	1.5
2	Develop the human resource and platform for building and hosting content in the Web 3 ecosystem. Develop atleast two more solutions for socially relevant problems.	1
3	Design, develop and launch certification programs in the new areas of Web 3, and CBDC Develop and publish PG Level Textbooks in Blockchain Technologies.	1.5
4	Develop and launch executive education programs in the areas Blockchain Networks, CBDC and Web 3.	1

6. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Build/Enhance the infrastructure for • CBDC/Central Bank tokens-related training and experiments in DeFi • Content creation using new age technologies	April – Sept.
2	Develop the human resource and platform for building and hosting content in the Web 3 ecosystem. Develop at least two more solutions for socially relevant problems.	April - March
3	Design, develop and launch certification programs in the new areas of Web 3, and CBDC Develop and publish PG Level Textbooks in Blockchain Technologies.	April – March
4	Develop and launch executive education programs in the areas Blockchain Networks, CBDC and Web 3.	June – March

7. Outcome of the Project (2024-25)

Sl No	Outcome
1	An industry-grade infrastructure for training/experiments in CBDC / DeFi for enabling research, innovations and consulting. A state-of-the-art content creation infrastructure with new age technologies.
2	Enhanced platform for online courses leveraging Web 3 technologies. Two technology solutions for potential adoption in socially relevant problems.
3	Two new certification programs in cutting edge technology domains in the area of Blockchains. Publication of a PG level Textbook in Blockchain Technology.
4	A highly specialised, industry-vetted/sponsored training program for working professionals.

8. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Build the infrastructure for CBDC/Central Bank tokens-related training and experiments - addition of new machines and web services - establishing ecosystem collaborations Enhance the capability of Content creation facility

	-Enhancing the infrastructure of the small studio available -Addition of specialized software platforms and tools
2	Develop the human resource and platform for building and hosting content in the Web 3 ecosystem. -Recruitment of specialized staff -Online platform enhancement to accommodate new content forms Develop at least two more solutions for socially relevant problems. -Collaborations with relevant stakeholders -Design and Development of solutions
3	Design, develop and launch certification programs in the new areas of Web 3, and CBDC -Establishing collaborations with relevant stakeholders -Recruitment of specialized staff -Design and development of content for the courses Develop and publish PG Level Textbooks in Blockchain Technologies. -Establishing collaborations with relevant stakeholders -Design and development of content for the book
4	Develop and launch executive education programs in the areas Blockchain Networks, CBDC and Web 3. -Establishing collaborations with relevant stakeholders from industry -Recruitment of specialized staff -Design and development of content for the courses

9. Physical progress

2023-24		
Sl No	Objectives	Physical achievements
1	Enhance the capability of the Decentralized Blockchain lab with external (outside KBA/DUK) access and Computational Infrastructure for enabling R&D.	Decentralized lab established. New R&D projects initiated with new content/publications, internship offering for KBAIC members, New Collaborations Established.
2	Enhance the capabilities of online learning platform for offering virtual internship programs to students. Develop at least two more solutions for socially relevant problems.	Online learning platform features enhanced with new self-paced tutorial/course content and mentoring. Solutions for two socially relevant projects developed and deployed Traceability for Toddy in collaboration

		with excise department, GoK. Pilot implementation of Certichain for certificate issuance by IMK.
3	Design, develop and launch three new certification programs	Three new programs developed and launched in the areas blockchain networks /tools and Web 3
4	Design, develop and launch minor programs for undergraduate and postgraduate engineering students. Develop and launch industry sponsored specialised versions of Blockchain Excellency Program.	Blockchain is offered as a stream of specialisation for masters students at DUK. BEP students started receiving industry sponsorships in companies developing new blockchain networks.
2022-23		
1	Enhancing the computational infrastructure	The computational infrastructure is enhanced by establishing a decentralised blockchain lab.
2	Enhancing the resource capability for KBA online platform improvement and developing/deploying solutions to socially relevant problems	1) The online platform of KBA is enhanced with new features and courses. 2) Developed solutions for State Election commission Digitisation initiative and KILA/SN Open University LMS for the Local body Elected members training program
3	Design, development and launching of new classroom/online certification programs and workshops.	Three new certification programs; viz; foundation program on Hyperledger Farbric, Ethreum Fundamentals program deigned and lanuched. NPCI Training partnership established. 6 bootcamps conducted, 6 in pipeline.
4	Design and implementation of long term training programs promoting research and	Designed and launched one year long Blockchain Excellence program. Blockchain is introduced as a stream of specialisation for masters students

	entrepreneurship.	at DUK.

10. Financial Outlay (2024-25)

Sl No	Components	Financial Outlay (Rs in Lakhs)	Remarks
1	Infrastructures-Setting up of lab, Hardware, Software and Computing	10.00	GPU Laptops & Desktops, Servers, Studio Equipment/Tools Infrastructure for CBDC/DeFi Experimental Lab and Public Blockchain Bootcamps, Lab for BEP program, PG/PhD internships, Private Network Configuration for developing PoCs/Socially relevant projects, New course videos creation, Technology podcast creation, online workshops/bootcamps for KBAIC member colleges
2	Faculty Cost	10.00	
3	Research & Development Expenses	60.00	Senior Scientists, Research Scientists, Research Engineers, Content Writer/Designer
4	Course & Other Expenses (Internships, Boot camps, Consumables, Rentals)	10.00	Cloud expenses for Hosting the learning management system, Subscription for Adobe/Zoom, For conduct of workshops/bootcamps/KBAIC interactions etc
5	Administrative overheads	10.00	
	Total	**100.00**	

Component No.8

Center for Digital Transformation & Innovation (CDTI)

1. New/Continuing/Spillover : Continuing

2. Type of the Scheme : State Plan Scheme

3. Financial Outlay : Rs 100 lakhs

4. Objectives (2024-25)

Sl No	Objectives (2024-25)
1.	To build capacity in DUK in terms of manpower and technical resources for the advancement of centre for Innovation and Digital Transformation
2.	To provide consultancy and training services to officials, decision makers, and staff in government departments, the public sector and corporates to pursue excellence through digital transformation and innovation.
3.	To act as a bridge between businesses and digital innovation and to help organizations to identify innovations that provide business value.
4.	To provide inputs and offer expertise among the expanding Micro, Small and Medium Enterprises (MSME) clusters of Kerala to foster non-linear growth by adopting innovative technology, product and process innovations.
5.	To collaborate with leading academics, research institutions, industries and the government to engage in cross-disciplinary research on the impact that digitalization will have on the future of organizations and work.
6.	To bring together researchers, professionals and experts at the national and international levels to collaborate in goal-oriented research in the related areas and disseminate research results to a wider community.
7.	To provide programs in training, internships, certification, education and outreach in the field to faculty members from academia, students and working professionals.

5. Planned Activities (2024-25)

Sl. No.	Planned Activities/Target	In Units
1	Research activities	12
2	Application development	5
3	Recruitment of research associates and interns	5

4	Trainings on various new technologies to provide capacity building in digital transformation	4

6. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1.	Determining the right research methodologies to address the precision of the identified research problems and Model fitting & its evaluation	2023-24
2.	Conducting a prototype implementation of a project within a chosen government or public sector entity in Kerala to pinpoint prospects for digital innovation and transformation.	2023-24
3.	Trainings, short courses, and certification programs in collaboration with industry partners to educate management and working professionals in organizations about formulating strategies and recognizing prospects for digital transformation.	2024-25
4.	Promote the dissemination of knowledge to both industry and academia by sharing research findings through the publication of research papers, whitepapers, and research reports.	2024-25

7. Outcome of the Project (2024-25)

Sl No	Outcome (2024-25)
1.	Research and development using wide range of advanced technologies aimed at facilitating digital transformation across diverse sectors and enhancing the overall productivity of the state.
2.	Engage in collaborative research endeavors and share findings with organizations across diverse industries, academic institutions, and research organizations. Explore how advancements in digital technology are expediting the digital revolution, fundamentally reshaping both society and business.
3.	Our mission is to assist organizations in Kerala's business and public sectors in accomplishing their objectives by disseminating information gathered through diverse interventions. We are dedicated to promoting efficient and effective public service delivery.
5	Transitioning towards an intelligent e-government approach involves promoting the adoption of intelligent systems within government organizations.

8. Detailed Description of the Activities for the year (2024-25)

Sl. No.	Description
1.	Research on Generative AI in e-Governance & Intelligent e-Governance
2.	Digital Transformation in the MSME on automation of quality control & Machine Management
3.	Business Analytics on supply chain & Logistics of Agricultural sector and R& D of its Digital solutions
4.	Research on analytical techniques in the health sector to derive meaningful insights and support decision-making.
5.	Research and Development of live caption generation in Sign language for videos in english & indian languages to help visually impaired people
6.	For early detection of pandemics and zoonotic diseases by implemention of Health Data analytics in kerala
7.	Plant disease & nutrient deficiency detection in the Musaceae family using deep learning techniques.
8.	Conduct a national conference on Digital Transformation in the Health Sector
10	Training & support to organizations in utilization of digital technologies & machine learning techniques

9. Physical Progress

Sl No	Objectives	Physical achievements of each resource person and cumulative achievements.
1	To build capacity in DUK in terms of manpower and technical resources to help establish a Centre for Innovation and Digital Transformation	• Completed recruitment process of five project staff members for the Centre. • Initiated recruitment process of 3 technical resource persons for the Centre. • One Reseach Associate attended Indian Workshop on Applied Deep Learning (IWADL-2023) at BITS Pilani, Goa Campus. • One Research Associate Attended State Level Awareness Workshop on e-Governance Standards and Guidelines organised by Minstry of Electronics and Information Technology • Three project staffs attended “Introduction to DevOps and Cloud" organised by Prathidhwani Technical Forum

2	To provide consultancy and training services to officials, decision makers and staff in government departments, public sector and corporates to pursue excellence through digital transformation and innovation.	• Training provided to Deputy Directors from the Department of Economics and Statistics on Bigdata Analytics and Application in Official Statistics at State Academy On Statistical Administration (SASA). • Training provided to officials from Local Self Government Department Planning in "introduction to the new avenues opened by Bigdata Analytics" • Training provided on "Data visualisation using Tableau" at Kannur University as part of a Faculty Development Program • Training provided on Data analysis using Python to officials from Dept. of Economics & Statistics, Govt. of Kerala • Conducted training on Official statistics and its application for BSc Students of Govt College kariavattom • Handled a session on Data Analysis Using Python for employees from Department of Economics and Statistics • Training provided on "Data Modeling using Tableau" at Kannur University as part of a Faculty Development Program • Training on Python For Econometrics - Foundation Level Training Program for students from Department of Economics, Nirmala College Muvattupuzha
3	To act as a bridge between businesses/government departments and digital innovation and to help organizations to identify innovations that provide business value.	• Conducted domain study and government process re-engineering to improve Special Livestock Breeding Program scheme of the Animal Husbandry dept. Govt. of Kerala. • Domain study for revamping of DESCAS application for the Department of Economics and Statistics. Govt. of Kerala, in progress. • Initiated the development of eticketing application & an analytics dashboard, which aids in analysing and forecasting revenue trends in the Department of Archaeology, Government of Kerala.

		• Provided the various digital solution for centre for one health and its Community Based Surveillance System for State Health System Resource Centre-Kerala under Dept. of Health & Family welfare, Govt. of Kerala. • Initiated Design & Development of Application for intelligent Data Engineering and Analytics for the Department of Economics and Statistics. Govt. of Kerala, in progress
4	To provide inputs and offer expertise among the expanding Micro, Small and Medium Enterprises (MSME) clusters of Kerala to foster non-linear growth by adopting innovative technology, product and process innovations.	• initiated discussions to conduct research and development in the field of Environmental, Social and Governance (ESG) for providing expertise to the industrial ecosystem including the MSMEs in Kerala. • Contributed to the One District One Idea project of the Kerala Development and Strategic Council in the training programs conducted for the key stakeholders • Initiated research and collaborative work for for predicting the machine failure and automating quality control in MSME sectors.
5	To pursue cutting-edge research on how digital technologies can be used to improve or transform operations and business processes, business models, and markets in a broad set of industries and sectors and develop a better understanding of digital ecosystems.	• Research ongoing on cattle weight estimation from 2D images using cognitive technologies. • Completed domain study & prepared FRS for implementing e-ticketing system in museums under Archaeology dept., Govt. of Kerala using digital technologies. • Completed preparation of AS-IS Document for Establishment of an Agency for Reporting Agriculture Statistics (EARAS) scheme, Dept. of Ecnomics and Statistics, Govt. of Kerala • Developed a tool for requirement gathering and User story preparation
6	To collaborate with leading academics, research institutions,	• Collaborated with Gulati Institute of Finance & Taxation, Thiruvananthapuram in the area of

	industries and the government to engage in cross-disciplinary research on the impact that digitalisation will have on the future of organizations and work.	econometrics. • Discussions initiated with Kerala Agricultural University for collaborations in the area of Digital transformation in agriculture and various researches
7	To bring together researchers, professionals and experts at the national and international levels to collaborate in conducting goal-oriented research in the related areas and disseminate research results to a wider community.	• Discussion ongoing with Dr. David Valle-Cruz, Professor (Associate), Universidad Autónoma del Estado de México for research collaboration in the area of intelligent government. • Discussions started on the topic innovation policy for sustainability reflections from australian agriculture. Jointly Organised by Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), The Commonwealth Scientific and Industrial Research Organisation (CSIRO), Guru Nanak Dev University, Patyala & ISC Intelligence in Science, Brussels
8	To provide programs in training, internships, certification, education and outreach in the field to faculty members from academia, students and working professionals.	• Internship provided to students of Digital University Kerala for conducting a literature review of various real-world research problems solving using machine learning techniques • Internship provided to students from Mar Ivanios College in the area of digital transformation through data analytics.

Financial Outlay

Sl No	**Digital Transformation & Innovation**	**Financial Outlay (Rs in Lakhs)**
1	Infrastructures- Setting up of lab, Hardware, Software and Computing	20.00
2	Research & Development Expenses	40.00
3	Faculty Cost	10.00
4	Course & Other Expenses	20.00
5	Overhead Charges	10.00
	Total	**100.00**

Component No. 9

Centre for Digital Transformation in Culture (CDTC)

The cultural and creative sectors are most affected by the current coronavirus (Covid-19) crisis along with many other industries. The current crisis is particularly critical for cultural and creative sectors due to the sudden and massive loss of revenue opportunities, especially for the more fragile players. Some artists benefit from public support (e.g. television, online channels, theatres) but may experience significant budget shortfalls. This crisis creates a structural threat to the survival of many firms and workers in cultural and creative production.

The envision of the Centre for Digital Transformation in Culture (CDTC) in Digital University is to improve the livelihood of artists, popularize art forms of Kerala, through Intelligent Digital Systems and improve the mental health of people with the help of Digital Arts.

Collaborating Organizations

1. Cultural department, GoK
2. BharathBhavan, Thiruvananthapuram
3. Malayalam Mission
4. Agriculture department
5. Agriculture University
6. Other research centres
7. Kala Mandiram

1. New/Continuing/Spillover : Continuing

2. Type of the Scheme : State Plan Scheme

3. Financial Outlay : Rs.80 Lakhs

4. Objectives (2024-25)

Sl No	Objectives
1	Develop and interactive (touch and gaze) websites to showcase Kerala traditional and tribal art forms using graph models
2	Develop a system to identify student's interest using Eye Tracking, Emotion, and Brain Signals while watching videos and listening music and there by design of brain networks
3	Develop a website to identify interest of a person based on the art performance with the aid of eye track, emotion, and business analytics.
4	Interactive virtual hall to showcase traditional art forms of Kerala.
5	Develop a Kiosk to showcase traditional art forms
6	Develop brain networks of people while they are listening to music and videos
7	Develop a recommendation system to design immersive theatre
8	Produce research publications, books and articles to promote Digital Transformation in Culture

5. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Brain networks for various application	3
2	Interactive website (touch and gaze), virtual hall, Kiosk	4
3	Internship for the students	10
4	Research outcome	9
5	Publications	9
6	Workshop	1
7	Collaborations	6

6. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Interactive website to showcase Kerala traditional and tribal art forms	2022-2024
2	Develop a system to identify student's interest using Eye Tracking, Emotion, and Brain Signals while watching videos and music.	2023-2026
3	Develop a website to identify interest of a person based on the art performance with the aid of eye track, emotion, and business analytics.	2023-2025
4	Interactive virtual hall to showcase traditional art forms of Kerala.	2024-2026
5	Develop a Kiosk to showcase traditional art forms	2024-2026
6	Develop brain networks while listening to music and videos	2023-2025
7	Develop a recommendation system for immersive theatre	2024-2026
8	Produce research publications, books and articles to promote Digital Transformation in Culture	2024-2027

7. Outcome of the Project (2024-25)

Sl No	Outcome
1	The popularity of Kerala's traditional and tribal art forms
2	State-of-the-art Research and Development facility and strengthening of the Masters, Ph.D. and Postdoctoral programs at KUDSIT.
3	Knowledge Creation: Identification of gaps and issues in the existing systems and developing novel solutions.
4	Developing technical talent capable of designing state-of-the-art connected systems.
5	Collaborations with Government departments and other organizations for knowledge, technology, and product development.
6	New communication initiatives by conducting workshops, conferences, outreach programs and revise the proposed solutions based on feedback.
7	Launch a series of activities targeted at empowering, supporting, and connecting artists worldwide.

8	Promote tourism by showcasing art forms

8. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Procurement of hardware, software tools and space based on the objectives of the proposed framework.
2	Expansion of the team and collaboration with industries, different government departments, and other organizations
3	Develop and showcase prototypes for demonstrations
4	Conduct research and development for unique solutions, Design, and development of appropriate methodologies as well as their implementation on relevant platforms.
5	Conduct the evaluation of the performance of the proposed framework.
6	Explore the possibilities of emotion recognition, eye tracking and eeg to understand human though process during the art performance.
7	Saliency models for understanding human attention mechanisms at behavioural and neural levels.

9. Physical Progress (2022-23) & (2023-24)

Sl No	Objectives	Physical achievements of each resource person and cumulative achievements.
2022-23		
1	To develop a Digital Arts School using Intelligent Digital Technologies in which experienced artists can teach the students through this platform	A pilot system is designed.
2	Archiving and documenting the existing Kerala traditional and tribal art forms	Data collected (short videos of Tribal and traditional art forms) from Bharath Bhavan under the Department of Culture, Kerala.
3	Market the Kerala traditional art forms worldwide.	Collected details of various worldwide centres of Cultural department and south zone cultural centres

4	Conduct cultural workshops, symposiums, events, etc. to enhance the mental health of the public.	Three events organized 1. Women's day, 8th March 2022 2.One session in International Workshop on Innovations and trends in Brain Computing Techniques - Cognizance' 22 3.Initiated collaboration with DeMontfort University, UK, and prepared a proposal to United Kingdom Research Initiative
5	Integrate and explore different areas like Culture, Agriculture, Science, Digital Science, Technology, Neurology, Artificial Intelligence, Machine Learning, Data Science, Brain Computing, thereby Upgrade Digital Arts.	1. Developed a system to classify Kathakali Mudras 2.Developed as chatbot for teaching assistance 3. Developed system for Leaf image classification 4. Developed a system to generate a heat map using visual saliency
6	To develop a Virtual Auditorium to showcase the art forms and attain earnings through it.	AR and VR lab is under construction at DUK
2023-24		
1	Developed a novel deep learning model for the classification of gestures.	Developed EnGesto, an Ensemble Learning Approach for Classification of Hand Gestures.
2	Developed an ensemble-based deep learning technique for object detection and classification and compared its performance with state-of-the-art systems.	Now, upgrading the accuracy by adding new features and Feature Norms.
3	Developed Bharathnatyam mudra classification system	Developed GAMNet for Gesture Identification, Unveiling Indian Classical Dance Mudras from Video Data with Weight Insights.
4	Launch a new website for archiving and documenting the existing Kerala traditional and tribal art forms	An interactive graphical website using 3D JS is getting ready.
5	Organise workshops, symposiums, events etc. interdisciplinary areas to improve the mental health of Public	A workshop is conducted in Govt. Boys LP School, Thycaud to motivate the students for innovation and to improve the mental health of students
6	Integrate and explore different	1. Eye tracking and Gaze

	areas like Culture, Agriculture, Science, Digital Science, Technology, Neurology, Artificial Intelligence, Machine Learning, Data Science, Brain Computing, there by Upgrade Digital Arts.	estimation 2. Emotion Recognition System 3. Emotion -aware multi-video interactive system with gaze tracking Submitted the papers for conference publication..
8	Research will be done to implement Natya Sastra with the aid of Saliency and Brain computing systems 1. Yatho Hasta thatho Drishti (2023-24) 2. Yatho Drishti thatho Manah (2023- 26) 3. Yatho Manah thatho Bhaava (2023- 26) 4. Yatho Bhaava thatho Rasa (2023- 26) Objective 6.1 will be implemented in 2023-2024 by studying eye movements, and its analysis using saliency models.	2Yatho drishti thatho manaha - Eye tracking system based on the user interest. 3.Yatho Manah thatho Bhaava - Implemented emotion recognition system based on human interest.

Financial Outlay

Sl No	**Center for Digital Transformation in Culture (CDTC)**	**Financial Outlay (Rs in Lakhs)**	
1	Infrastructures- Setting up of lab, Hardware, Software and Computing	20.00	Interactive wall, Laptops and Desktops, Servers/ cloud for Data storage
2	Research & Development Expenses	34.00	
3	Faculty Cost	8.00	
4	Course & Other Expenses	10.00	Data Collection and Other Expenses
5	Administrative Overhead	8.00	
	Total	**80.00**	

Component No. 10

Centre for Intelligent Government

1. New/Continuing/Spill over: : New

2. Type of the Scheme : State Plan Scheme

3. Financial Outlay : Rs 130 lakhs

About the Centre for Intelligent Government at DUK

The rise of the digital age is expected to impact public governance in multiple ways. Digital transformation can help the governments become more agile and respond faster to emerging trends and future crises. Government transformation through intelligent automation encompasses adopting a range of novel technologies from robotic process automation to highly sophisticated cognitive technologies, including machine learning, natural language processing, and artificial intelligence. While adopting these advanced technologies, it is also vital for the government to ensure that the departments and public sector adopt these technologies responsibly to maintain robust governance.
Considering the fact that digital technologies can bring about improvements in governance and administration, the Centre for Intelligent Government at Digital University Kerala plans to assist the Government of Kerala in digital transformation of the Government. It will work towards building long-term capabilities for the government in digitizing and automating government processes, workflows and services for citizens. The Centre will encourage participation from the academia, public sector and industry, to take a collective approach in building a Smart Government.

The research, development and education activities at the centre will focus mainly around the following themes:

- Identify ways in which service delivery processes and workflows can be redesigned to integrate emerging technologies such as Artificial Intelligence, Robotic Process Automation, Big Data Analytics, Cyber Security and Blockchain.
- Using data to identify citizen needs and explore the ways in which government processes can be tailored to give a consistent experience to the citizens.
- Investigate and coordinate among different agencies to see how citizen data can be shared to provide seamless government services.
- Development of digital experience platforms to support personalized citizen services.
- Conceptualize integrated data management systems so that citizens can provide the data once and avail multiple government services.
- Conduct studies on the issues and measures when applying AI and other advanced technologies to public services.
- Pursue research on adopting an advanced analytics-driven approach to provide strong governance and end to end transparency.

1. Objectives (2024-25)

Sl No	Objectives
1	To strengthen Centre for Intelligent Government at DUK
2	To provide consultancy and training services to Government departments, Judiciary, public sector and IT services organisations to build capacity in intelligent transformation of Government.
3	To build capacity for Government Officials in the context of Intelligent Governance.
4	To build capacity in identifying and selecting appropriate solutions for Intelligent Government.
5	To facilitate Government departments to provide better user experience using appropriate technologies in the context of intelligent Government
6	Identification of appropriate use cases for intelligent Government by analysing present citizen pain points.
7	To train government functionaries aspects of security, privacy, ethics and inclusiveness in the context of Intelligent Government
8	To collaborate with leading academics, research institutions, industries and the government to assess potential usage of intelligent technologies in Government.
9	To provide training programs, consultancy, internships, certification, education and awareness in the area of Intelligent Governance.

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1.	Strengthening of Centre for Intelligent Government at the DUK.	1
2.	Recruitment of additional manpower.	1
3.	Identification and selection of departments to develop the Pilot Implementation	3
4.	Development of the intelligent systems	1
5.	Organizing a National Seminar on Intelligent Government in partnership with industries, research institutions, national bodies in e-Governance and the Government of Kerala	1
6.	Collaborate with leading academics, research institutions, industries and the government to assess potential usage of intelligent technologies in Government.	1
7.	Conducting capacity building programs for government functionaries in the area of security, privacy, ethics and inclusiveness in the context of Intelligent Government	4
8.	Development of case studies / publication of research papers.	1

3. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Strengthening of Centre for Intelligent Government at the DUK.	2024
2	Recruitment of additional manpower.	2024
3	Identification and selection of departments to develop the Pilot Implementation	2024
4	Development of the intelligent systems	2025
5	Organizing a National Seminar on Intelligent Government in partnership with industries, research institutions, national bodies in e-Governance and the Government of Kerala	2025
6	Collaborate with leading academics, research institutions, industries and the government to assess potential usage of intelligent technologies in Government.	2024
7	Conducting capacity building programs for government functionaries in the area of security, privacy, ethics and inclusiveness in the context of Intelligent Government	2024
8	Development of case studies / publication of research papers.	2025

4. Outcome of the Project (2024-25)

Sl No	Outcome
1	Trained professionals in government on the benefits of adopting digital technologies for providing better services to citizens.
2	Demonstrate the application potential of advanced digital technologies in government processes and better decision making.
3	Strengthening collaboration with industry, academia, international bodies and the government for exchange of knowledge and ideas for enhancing the quality of governance by adopting advanced technologies in government information systems.
4	Development of additional case studies / publication of research papers

5. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Strengthening of Centre for Intelligent Government at the DUK. The strengthening of the Centre for Intelligent Government at DUK represents a pivotal step towards advancing the university's capabilities in the field of artificial intelligence and data analytics. This initiative aims to bolster research, innovation, and practical applications in areas such as smart governance, data-driven decision-making, and public policy

	optimization. By consolidating resources, fostering collaboration, and attracting top-tier talent, the university is poised to become a leading hub for cutting-edge solutions that enhance government efficiency and effectiveness, ultimately benefiting society at large.
2	Recruitment of additional manpower required for strengthening the Centre.
3	Identification and selection of departments to develop the Pilot Implementation The process of identifying and selecting departments for the pilot implementation is a crucial step in our strategic planning. It involves a comprehensive evaluation of various factors, including departmental readiness, alignment with organizational goals, and potential for positive impact. Through a systematic approach, we aim to choose departments that will serve as effective pioneers in testing and refining our implementation strategies, ensuring a successful and sustainable rollout across the organization.
4	Development of the intelligent systems The development of intelligent systems represents a transformative journey at the forefront of technological innovation. With advancements in artificial intelligence, machine learning, and data analytics, intelligent systems are becoming increasingly adept at mimicking human cognitive processes, problem-solving, and decision-making. These systems have found applications in a wide array of domains, from healthcare and finance to autonomous vehicles and smart cities. As we continue to refine and expand the capabilities of intelligent systems, we pave the way for a future where these systems work seamlessly alongside humans, augmenting our abilities and improving the quality of life across the globe.
5	Organizing a National Seminar on Intelligent Government in partnership with industries, research institutions, national bodies in e-Governance and the Government of Kerala We will collaborate with industries, research institutions, national bodies in e-Governance, and the Government of Kerala to organize a National Seminar on Intelligent Government. This event promises to be a dynamic platform for sharing insights, knowledge, and innovative ideas on the transformation of government services through intelligence and technology. Join us in exploring how intelligent government practices can lead to more efficient, accessible, and citizen-centric services, ultimately driving progress and development in our society. Be a part of this insightful journey towards the future of governance.
6	Collaborate with leading academics, research institutions, industries and the government to assess potential usage of intelligent technologies in Government.

	In our pursuit of advancing the integration of intelligent technologies in government operations, we are dedicated to fostering strong collaborations with prominent academics, esteemed research institutions, influential industries, and governmental bodies. Through these strategic partnerships, we aim to comprehensively assess the potential applications and implications of intelligent technologies within the government sector. By leveraging the collective expertise and resources of these stakeholders, we seek to facilitate the seamless integration of cutting-edge solutions, ensuring that government functions become more efficient, transparent, and responsive to the ever-evolving needs of our society. Together, we aspire to harness the transformative power of intelligent technologies for the betterment of our governance systems and the well-being of our citizens.
7	Conducting capacity building programs for government functionaries in the area of security, privacy, ethics and inclusiveness in the context of Intelligent Government In an era where technological advancements are transforming the landscape of governance, it is paramount to equip government functionaries with the knowledge and skills necessary to navigate the intricate realms of security, privacy, ethics, and inclusiveness. Our capacity building programs stand as a beacon, illuminating the path towards an Intelligent Government. Through these initiatives, we aim to empower government officials with the insights and expertise needed to ensure that the adoption of intelligent technologies aligns with the values of security, privacy, ethics, and inclusiveness, fostering a government that is both innovative and responsible. Join us on this journey of knowledge and empowerment, as we prepare government functionaries to thrive in an era of Intelligent Government.
8	Development of case studies / publication of research papers. The development of case studies and the publication of research papers are essential components of our academic endeavors. These activities not only contribute significantly to the body of knowledge in our respective fields but also enhance our institution's reputation as a hub for research and innovation. Through rigorous research and the creation of informative case studies, we aim to address real-world challenges, offer valuable insights, and foster intellectual growth within our academic community. Our commitment to producing high-quality research outputs remains unwavering, reflecting our dedication to advancing knowledge and promoting academic excellence.

6. Physical Progress

#	Objectives	Physical achievements of

		each resource person and cumulative achievements.
1	To establish a Centre for Intelligent Government at DUK	Process Initiated
2	To provide consultancy and training services to government departments, public sector and IT services organisations to build capacity in intelligent transformation of Government.	Discussions initiated with the High Court of Kerala and departments and identified broad areas of engagements.
3	To build capacity for Government Officials in the context of Intelligent Governance.	Design of capacity building programs under progress.
4	To build capacity in identifying and selecting appropriate solutions for Intelligent Government.	Initiated
5	To facilitate Government departments to provide better user experience using appropriate technologies in the context of intelligent Government	Potential use cases are being explored.
6	Identification of appropriate use cases for intelligent Government by analysing present citizen pain points.	Potential use cases are being explored.
7	To train government functionaries aspects of security, privacy, ethics and inclusiveness in the context of Intelligent Government	Several batches of training in the mentioned area are conducted at DUK.
8	To collaborate with leading academics, research institutions, industries and the government to assess potential usage of intelligent technologies in Government.	Will be initiated soon
9	To bring together researchers, professionals and leaders to formulate policies in the context of Intelligent Governance.	Will be initiated soon
10	To provide training programs, consultancy, internships, certification, education and awareness in the area of Intelligent Governance.	Will be initiated soon

Financial Outlay

Sl No	**Centre for Intelligent Government**	**Financial Outlay (Rs in Lakhs)**
1	Infrastructures- Setting up of lab, Hardware, Software and Computing	20.00
2	Research & Development Expenses	60.00
3	Faculty Cost	13.00

4	Course & Other Expenses	24.00
5	Administration Overhead Charges	13.00
	Total	**130.00**

Component No. 11

Kerala Security Audit and Assurance Centre (K-SAAC)

1. New/Continuing/Spillover : New
2. Type of the Scheme : State Plan Scheme
3. Financial Outlay : **Rs 100 Lakh only**

We are witnessing several news articles about applications that are hacked within days or weeks of their release. Security assessment looks at the application and finds weaknesses and suggests fixing the same before it is released.
The security auditing activities of the centre may be broadly divided into following four categories.

1) Software Audit: The software audit can be performed automatically, using commercially or freely available tools, as well as manually, going over each module separately in an application.
    a) Web application security: Vulnerabilities in web applications are investigated, documented and reported according to the potential damage that may arise if they are exploited.
    b) Mobile application security: The proliferation of mobile devices has given birth to a new era in communication called “mobile era”. A large number and a wide variety of feature-rich applications are knocking our door every day.
    c) Web service security: A Web service is a standardized way of establishing communication between two Web-based applications by using open standards over an internet protocol backbone.
2) Infrastructure Audit: The infrastructure audit is a technical assessment of an organization’s IT infrastructure i.e. network, computer, and operating systems, etc.

4. Objectives (2024-25)

Sl No	Objectives
1	Expanding the team and collaborating with external experts/agencies.
2	Procuring necessary hardware and commercial software and setting up the full-fledged security auditing lab.
3	Performing security auditing of inhouse applications and IT infrastructure as well as of external agencies like Govt and corporate clients.

4	Starting cyber security training and certification programs in collaboration with EC Council International.
5	Augmenting cyber security teaching and certification programs of DUK.
6	Empanelment of National Accreditation Board for Testing and Calibration Laboratories (NABL) for Software & IT System Testing.
7	Building a Malware Analysis Lab
8	Capacity Building & Lab Setup for IoT Security Auditing
9	Capacity Building & Lab Setup for Digital Forensic Services
10	Setting up a Lab for Data Recovery
11	Hosting Security Conference/CTF/Hackathon
12	CERT-IN empanelment for cyber security auditing

5. Planned Activities (2024-25):

#	Planned Activities / Target	In Units
1	State-of-the-art security auditing digital forensics and malware analysis labs at DUK	1
2	Secure and robust systems, IT infrastructure and software/applications developed by DUK and IIITM-K	1
3	Collaborations with industries and research institutions for developing security auditing tools / mechanisms	1
4	Training and Certification programs in cyber security	0.5
5	CERT-IN empanelment for cyber security auditing	2
6	Security auditing services to various departments in the State, Centre and Industries.	1
7	NABL empanelment for KSAAC Lab for Software & IT System Testing.	1
8	Setting up a Lab for Data Recovery	1
9	Security Conference, Capture The Flag and Hackathon	0.5
10	Setting up an industry recognised training and certification centre for internationally reputed certifications	1

6. Project Phasing (Year Wise)

Sl No	Project Phasing	Year
PHASE 1		
1	Empanelment of National Accreditation Board for Testing and Calibration Laboratories (NABL) for Software & IT System Testing.	2024-25
2	Performing security auditing of applications and IT infrastructure of internal and external agencies like Govt and	2024-25

	corporate clients.	
3	Augmenting cyber security teaching and certification programs of DUK.	2024-25
4	Hosting Security Conference/CTF/Hackathon	2024-25
5	Setting up a Lab for Data Recovery	2024-25
PHASE 2		
6	Participating in all the evaluation process of CERT-IN and accomplishing the empanelment.	2024-25
7	Setting up an industry recognised training and certification centre for internationally reputed certifications	2024-25
8	Building a Malware Analysis Lab	2024-25
9	Digital Forensic Services	2024-25
10	Training and Certification programs in cyber security	2024-25

7. Outcome of the Project

#	Outcome
1	National Accreditation Board for Testing and Calibration Laboratories (NABL) Accredited Lab for Software & IT System Testing
2	CERT-IN Empanelled Security Auditing Lab
3	Secure CyberSpace
4	Examiner of Electronic Evidence
5	Malware Analysis Lab
6	Data Recovery Lab
7	Industry recognised training and certification centre for internationally reputed certifications
8	Cyber Security Trained Professionals
9	Research Publications and Tools
10	Security Conference/CTF/Hackathon

8. Detailed Description of the Activities for the year (2024-25)

#	*Description*
1	Participating in all the evaluation process of CERT-IN and accomplishing

	the empanelment. The CERT-IN empanelment is a five step process. ● Application Submission ● Document Verification ● Offline VAPT ● Online VAPT ● Personal Interaction with Technical Team We need to successfully complete these 5 steps to get CERT-IN empanelment.
2	Performing security auditing of applications and IT infrastructure of internal and external agencies like Govt and corporate clients. We will perform security auditing services for web applications, mobile applications, IT systems, network infrastructure,for various departments of GoK, other states, GoI, industries and private clients.
3	Training programs in cyber security We will design KSAAC certification programs in the area of cyber security and forensic for various levels of users. Some of the certifications may be similar as follows: Secure IT User Certification: Basic Level for students, Government employees, etc Secure Coding Practices: For Developers Secure Systems Configurations: For IT support engineers Certifications programs from EC Council in cyber security CEH, CHFI, CSA, CPENT, and CND, etc.
4	Augmenting cyber security teaching and certification programs of DUK. We will support in teaching courses for MSc, MBA and PGDeG programs of DUK.
5	Empanelment of National Accreditation Board for Testing and Calibration Laboratories (NABL) for Software & IT System Testing. We will apply to NABL for Software & IT System Testing empanelment of the KSAAC lab. Following are the steps for NABL Accreditation Process. 1. Application for Accreditation by KSAAC 2. Acknowledgement and Scrutiny of Application by NABL 3. Document Review 4. Pre-Assessment of KSAAC by Lead Assessor 5. Final Assessment of KSAAC 6. Scrutiny of Assessment Report 7. Recommendations for Accreditation by Accreditation Committee 8. Approval for Accreditation by NABL 9. Issue of Accreditation Certificate to KSAAC by NABL
6	Set up Data Recovery Lab We will set up a data recovery lab for the users/clients to recover lost data.

7	Building a Malware Analysis Lab A user can interact with our cloud based malware analysis with the help of a web application. In that web client application, users can enter any doubtful URLs, PE files(exe or dll), non PE files (ELF, apk and so on) and cross platform malicious files (PDF files, word document files and so on). In the malware analysis server, we configure the cloud computing platforms/tools such as aneka, and openstack etc. The server analyses the types of the file (PE/non-PE, cross platform), use corresponding reverse engineering tools to collect the static features and then finally launch a virtual machine or emulator corresponding to the file (Windows, Linux or Android) for collecting the dynamic features such as system calls, system metric like CPU, memory usages, registry modification related information, network packets, memory snapshots etc.. With these features, the server is capable of detecting the type and category of attack using the distributed/federated machine learning algorithms or frameworks configured using the tools such as hadoop, OpenFL etc. Finally, the user will get a detailed report on the behaviour of the uploaded malicious file.
8	Digital Forensic Services We will establish a digital forensic facility like an examiner of electronic evidence and offer services to various clients. Some of the services offered under it are data recovery, mobile device forensics, etc.
9	Hosting Security Conference/CTF/Hackathon We will host a security conference, capture the flag and hackathon competitions.

9. Physical Progress (2022-23) & (2023-24)

Sl No	Objectives	Physical cumulative achievements of the project
1	To set up a state-of-the-art security auditing facility at KUDSIT.	One module of 20 seating capacity is allocated to KSAAC at KABANI. We have compiled the open source tools for security auditing and completed initial setups and configurations to perform security auditing tasks. Also, initiated to procure additional hardware (server, laptop, printer and networking devices).
2	To perform security audits of the systems, network infrastructure and software/applications developed.	We configured the lab to undertake security auditing assignments. Also, we are in the process of upgrading the facilities by adding more computing and networking devices. We have performed a couple of security audits of web, mobile applications and IT infrastructure. 1. GST Lucky bill 1.0.4 Mobile App, Kerala State GST Department, GoK 2. Certichain Web Application of KBA

		3. Networks and IT Infrastructure at DUK 4. RTI Knowledge Portal of Institute of Management in Government, GoK 5. Online Accreditation Portal of I-PRD, GoK 6. Visitor's Registration Portal of DUK 7. Norka - Connect Kerala Portal, GoK 8. Excise e-TODDY Portal, GoK 9. GIS-Hydrography Portal - HYMSYS 10. KSAAC Portal 11. DUK Intranet Portal
3	To collaborate with industries and research institutions for developing security audit tools / mechanisms.	10. We have initiated discussion with Mrs Mitali Chatterjee, Director General (Retd) STQC Kolkata and Expert Consultant at Jadavpur University and many other industry experts. 11. Became an academic partner of the EC Council (The International Council of Electronic Commerce Consultants) for training and certification in Cyber Security, with plans to acquire various certifications for the KSAAC team and extend suitable certifications to the student, alumni and staff community of the DUK. 12. Initiated discussion with Shri Hari Shankar IPS, SP, Cyber Operations, Kerala Police to collaborate in various areas of the cyber operations of Kerala Police.
4	To start cyber security related training and certification programs.	1. Two Days National Webinar on "Cyber Security & Cyber Crimes" on July 4 & 5, 2022. 2. One Week Course on Cyber Hygiene Practices during September 14-20, 2022 3. Conducted "CYBER HYGIENE PRACTICES" (A Cyber Security Awareness Program) for final-year computer engineering students at Govt Polytechnic College, Attingal, Thiruvananthapuram, during September 26-30, 2022. 4. Conducted "BE CYBER SMART" (A Cyber Security Awareness Program) for final-year computer engineering students at Govt Polytechnic College, Pala, Kottayam, during October 10-14, 2022. 5. Conducted "DIGITAL SAFETY" (A Cyber Security Awareness Program) for differently-abled students at Govt Polytechnic College Kaimanam, Trivandrum, during November 7-11, 2022. 6. Conducted "BE AWARE BE SECURE" (A Cyber Security Awareness Program) for Computer Engineering Students at Govt Polytechnic College Neyyattinkara, Trivandrum, during November 14-18, 2022. 7. Hosted Google Developer Student Clubs Wonder

		of Wonders (GDSC WOW) on April 29-30, 2023. 8. Conducted a two-week short course on SECURE YOUR CYBERSPACE for 2nd-semester computer engineering students at Govt Polytechnic Kaimanam, Thiruvananthapuram, during May 15 to 26, 2023. 9. Hosted a seminar on Cyber Security for District Institute of Education and Training (DIET) Attingal at the Digital University campus on May 19, 2023. 10. Conducted a one-day workshop on Digital Signature and Public Key Infrastructure in association with CDAC Bangalore and CCA on May 29, 2023. 11. Conducted a four-week course on BE CYBER SMART: SECURE YOUR DIGITAL LIFE for 4th-semester computer engineering students at Govt Polytechnic Attingal, Thiruvananthapuram, during May 10 to June 2, 2023. 12. Hosted a one-day workshop on Google IO Extended on June 10, 2023. 13. Conducted a one-day awareness program on Plan your Future: Cyber Security Awareness for Early Career Professionals on July 8, 2023. 14. Conducted a one-day awareness program on "Navigating the Cyber Security Landscape: Essential Training for Career Starters" on July 15, 2023.
5	To augment cyber security teaching and certification programs of KUDSIT.	Following MSc courses are handled by the KSAAC team. 1. Ethical Hacking and Defensive Technologies (Semester - 3) 2. Ethical Hacking and Penetration Testing Lab (Semester - 3) 3. Mobile Application Security (Semester 3) 4. Leveraging AI Analytics for Digital Transformation (Semester 3) 5. Malware Analysis and Reverse Engineering (Semester - 2) 6. Cyber Analytics (Semester 2) 7. Security Auditing Lab (Semester 2) 8. Cyber Analytics Lab (Semester 2) 9. Information Security (Semester 2, PGDeG) 10. Cyber Security and Forensics Lab - Batch 1 (Semester - 1) 11. Cyber Security and Forensics Lab - Batch 2 (Semester - 1)

13. If it is Women related Scheme: Yes, 30%. These schemes may include training programs, mentorship opportunities, and awareness campaigns specifically tailored to women in order to address the gender gap often found in the industry and government sector.

14. If the scheme is beneficial to Children: Yes, 5%. These schemes may include training programs, mentorship opportunities, and awareness campaigns specifically tailored to women in order to address the gender gap often found in the industry and government sector.

15. If the scheme is beneficial to Transgenders: No

16. If the scheme is related to SC/ST: Yes, beneficial to SC/ST

Financial Outlay

Sl No	**Kerala Security Audit and Assurance Centre (K-SAAC)**	**Financial Outlay (Rs in Lakhs)**	
1	Infrastructures-Setting up of lab, Hardware, Software and Computing	10.00	Security Auditing AND Digital Forensic lab setup,
2	Research & Development Expenses	60.00	Lead Security Auditor, Penetration Testers, Digital Forensic Investigator, SOC Analyst, Security Analyst, Sr Security Researcher, Cyber Security Lab Instructore etc
3	Faculty Cost	10.00	
4	Course & Other Expenses	10.00	
5	Administration Overhead Charges	10.00	
	Total	**100.00**	

Component No. 12

Centre for Excellence in Intelligent IoT (State Share)

1. New/Continuing/Spillover : Continuing

2. Type of the Scheme : State Plan Scheme

3. Financial Outlay : **Rs 50 Lakh only**

Centre of Excellence in intelligent internt of things is a collaborative project by Centre for Materials for Electronics Technology (C-MET), Thrissur in association Maker Villag, DUK, KeralaStart-up Mission and. Govt. of Kerala at the total estimated cost of Rs.4182.89 Lakbs (Melt'?: Rs. 2198.94 lakhs; Government of Kerala: Rs. 1427.20 lakhs; Industry (In kind): Rs. 556.75 lakhs) for the duration of five years.

The scheme focused on

a. To translate the research on sensors (temperature. humidity, pressure and acoustic) to commercially valuable products.

b. To create the state-of-the-art facilities for: (I) sensor manufacturing, (2) intelligent sensor system hardware and Al software development, and (3) comprehensive compliance testing.

c. To implement innovative products and solutions for the industry those are specifically tuned to cater the industry needs. –

d. To provide a common facility to industries for prequalificati.on of the electronic products for obtaining the certificate of conformity and compliance.

e. To provide business and mentorship support to Start up companies along with the facilities to realize an industry standard product solution with intelligent loT sensors.

f. To promote innovation and entrepreneurship through design challenges, outreach programs and incubation grants.

Total Project cost: Rs 4182.89 lakhs lakhs
MeitY contribution- Rs 2198.94 lakhs
Government of Kerala- Rs 1427.20 lakhs
Industry Contribution- Rs 556.75 lakhs

4. Objective:

Sl No	Objectives
1	Manpower requirement for IIoT product development and testing
2	IP filing and commercialization

3	Test services for PCB
4	Product marketing and industry engagement
5	Connecting industry, institutions, government, MSMEs & startups with national & international IIoT ecosystem
6	Incubate and scale inventive deep-tech startups working on frontier technologies

5. Physical Target

Sl No	Target
1	Product design in the field of IoT sensors
2	IOT chip development
3	Capacity building in IIOT
4	Filing Ips for technology transfer
5	Technology commercialization

6. Project Phasing

Sl No	Project Phasing:	Year
1	IoT board integration with sensors	
2	Testing different sensors and IoT products	
3	Conducting training programmes in IoT	
4	Training and product development using IoT based PCB	
5	Technology transfer of products	
6	Incubate deep-tech startups	

7. Outcome of the Scheme:

Sl No	Outcome of the Scheme:
1	Product design in the field of IoT and sensor integration
2	IoT based chips and its applications
3	Capacity building in the areas of IoT and Sensors
4	Filing IPs for technology transfer
5	Prototypes and commercialized products from incubated startups

8. Detailed Description of the Activities for the year:

Sl No	Detailed Description of the Activities for the year:
1	Recruitment of manpower expertized in the field of IoT and board design
2	Design and Development of products meeting industry standards
3	Design and fabrication of IoT based chipsets
4	Complete drafting and filing the IPs
5	Capacity building in the areas of board design, Sensor Manufacturing

6	Organise workshops for connecting industry, institutions, government, MSMEs & startups with national & international IIoT ecosystem
7	Incubate and scale inventive deep-tech startups working on frontier technologies

9. Financial Outlay

Sl No	**CoE IIOT Sensors (State Share)**	Rs in Lakhs
1	Research & Development Expenses	30.00
2	Faculty Cost	5.00
3	Other Expenses	10.00
4	Administration Overhead Charges	5.00
	Total	**50.00**

Component No. 13

Centre for Electronics Design & Testing

1. New/Continuing/Spillover : Continuing
2. Type of the Scheme : State Plan Scheme
3. Financial Outlay : **Rs 50 Lakh only**
4. Objectives (2024-25)

Sl No	Objectives
1	Research and Innovation To foster a culture of continuous research and innovation in the field of electronics design and testing, leading to the development of cutting-edge technologies and solutions.
2	Education and Training To provide high-quality education and training programs that equip students and professionals with the knowledge and skills required for electronics design and testing, fostering the next generation of experts in the field.
3	Collaboration and Partnerships To establish collaborative relationships with industry, academia, and research institutions to promote knowledge exchange, joint projects, and technology transfer in electronics design and testing.
4	Industry-Relevant Projects To engage in industry-driven projects that address real-world challenges,

	applying electronics design and testing expertise to develop practical solutions.

5. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1	Objective 1: Research and Innovation Activity: Establish dedicated research teams in various electronics design and testing domains. Target: Publish a minimum of 4 research papers in reputable journals and conferences annually.	1
2	Objective 2: Education and Training Activity: Develop a comprehensive curriculum for electronics design and testing courses. Target: Graduate a minimum of 50 students annually from the educational programs offered.	1
3	Objective 3: Collaboration and Partnerships Activity: Forge research collaborations with at least 5 industry partners. Target: Execute a minimum of 3 joint projects with partner organizations annually.	1
4	Objective 4: Industry-Relevant Projects Activity: Identify and prioritize industry challenges in electronics design and testing. Target: Successfully complete a minimum of 2 industry-driven projects per year.	1

6. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1	Objective 1: Research and Innovation Activity: Form research teams and initiate initial projects. Target: Publish 5 research papers. Objective 2: Education and Training Activity: Develop the initial curriculum for courses. Target: Start the first batch of students. Objective 3: Collaboration and Partnerships Activity: Identify potential industry partners. Target: Establish partnerships with at least 2 organizations.	Year 1
2	Objective 1: Research and Innovation Activity: Expand research projects. Target: Publish 10 research papers. Objective 2: Education and Training Activity: Offer a wider range of courses. Target: Graduate the first batch of students.	Year 2

	Objective 3: Collaboration and Partnerships Activity: Begin joint research projects with partners. Target: Complete 2 collaborative projects.	
3	Objective 1: Research and Innovation Activity: Deepen research activities. Target: Publish 5 research papers. Objective 2: Education and Training Activity: Enhance course offerings. Target: Increase student enrollment by 20%. Objective 3: Collaboration and Partnerships Activity: Strengthen existing partnerships. Target: Complete 3 collaborative projects. Objective 4: Industry-Relevant Projects Activity: Increase industry engagement. Target: Successfully complete 3 industry-driven projects.	Year 3

7. Outcome of the Project (2024-25)

Sl No	Outcome
1	The hardware boards for teaching in classrooms
2	Test the PCB boards with microprocessors for compliance
3	Signal integrity results for the boards
4	Verification results for chip fabrication on various mixed signal IPs

8. Detailed Description of the Activities for the year (2024-25)

Description
A - Activities
A1.1 Identify the logic block for the IPs in sensors
A1.2 Sensor integration components like opamps
A1.3 Evaluate the performance and compare with the ideal case
A2.1 Processor block design and testing
A2.2 SystemVerilog and UVM based testing
A2.3 Tape out of the design
A3.1 Development board design for differently abled
A3.2 Include all labs for analog
A - Activities
A1.1 Identify the logic block for the IPs in sensors
A1.2 Sensor integration components like opamps
A1.3 Evaluate the performance and compare with the ideal case
A2.1 Processor block design and testing
A2.2 SystemVerilog and UVM based testing
A2.3 Tape out of the design

9. Physical Progress (2023-24)

Sl No	Objectives	Physical achievements of each resource person and cumulative achievements.
1	Objective 1: Research and Innovation	Publications and grants
2	Objective 2: Education and Training/testing	Training programs and testing consultancy
3	Objective 3: Collaboration and Partnerships	MoUs
4	Objective 4: Industry-Relevant Projects	Consulting projects

Financial Outlay

Sl No	**Centre for Electronics Design & Testing**	**Financial Outlay (Rs in Lakhs)**
1	Research & Development Expenses	30.00
2	Faculty Cost	5.00
3	Course & Other Expenses	10.00
4	Administration Overhead Charges	5.00
	Total	**50.00**

Component No. 14

Centre of Excellence in Social Engagement

1. New/Continuing/Spillover : New
2. Type of the Scheme : State Plan Scheme
3. Financial Outlay : **Rs 50 Lakh only**

Digital University Kerala functions with the motto, “Curating a responsible digital world” From its inception, DUK has been developing a dynamic community engagement programme that includes Digital Access for Community Empowerment (DACE), a core course for all Master’s students. The university is a Participating Institute of Unnat Bharat Abhiyan (UBA) of the Ministry of Education, Government of India. The university also hosts a National Service Scheme (NSS) unit of the Ministry of Youth Affairs and Sports, Govt. of India.

DUK integrates academic programmes with social engagement to provide students ample opportunities to interact directly with the communities and understand their challenges. These offer long-term and short-term associations between the university community and the villages through local self-governing/Panchayati Raj institutions. Development of the less privileged is always the motivating spirit of volunteering. In DUK, student volunteers are encouraged to apply the technical knowledge they acquire as part of the academic programmes for solving challenges the communities face through innovative problem-solving.

As part of UBA, DUK has adopted five villages: Mel Thonnakkal, Keezh Thonnakkal, Veiloor, Uliyazhathura, and Athiyannoor villages in Thiruvananthapuram District. Social engagement and service activities are already being conducted in these five villages. A household survey has been initiated in 2023 by student volunteers. SEC has an integrated approach towards its volunteering programmes and the latter consist of short-term and long-term programmes. The following short-term activities have already been completed.

- Cancer awareness Programme with breast cancer screening for women and awareness talk in Uliyazhathura Village.
- Market cleaning drive in Keezh Thonnakkal Village and the Pothencode town nearby.
- Beach cleaning drive in Kochuveli.
- Cancer awareness Programme with breast cancer screening for women in Mel Thonnakkal Village.
- Early cancer detection and awareness session for the DUK community
- Life Style and Health Awareness with special emphasis on Women's Health
- International Women's Day within the Campus
- Poster and quiz competitions for the DUKians
- Workshop on waterbodies management in association with Navakeralam Karmapadhathi and HarithaKeralam Mission, MGNREGS, Dept of Minor Irrigation, Kudumbashree, Pothencode Panchayat
- Digital Literacy Campaign of Pothencode Panchayat from 2nd October 2023

The following long term- programmes have been initiated and are continuing with the help of other stakeholders from within and outside the campus.

- Water Bodies Preservation and Management (Other stakeholders involved- Harithakeralam Mission, MGNREGS, Dept of Minor Irrigation, Kudumbashree, Pothencode Panchayat)
- Geospatial Mapping of Thettiyar in the Pothencode Panchayat (Centre for Geospatial Technology and C.V. Raman Centre of Ecological Informatics, DUK)
- Library cum Janasevanakendram for a colony predominantly inhabited by the Scheduled Caste population in Ward No 9 of Athiyannoor village
- Research on Digital Literacy and Use of Digital Gadgets: Trend Analysis of Women across age and communities (in Pothencode Panchayat; already pilot

study is completed with interviews of elected members of the Pothencode Panchayat and members of Ayalkkoottam and Kudumbashree)

- Water bodies mapping is being planned to be conducted in all the five adopted villages in Thiruvananthapuram District under Unnat Bharat Abhiyan.
- Interventions are planned in Digital Literacy and support to micro-enterprises in association with agencies like Kudumbasree, Jalashree Mission, etc.

It is proposed to expand and enhance the activities of the Social Engagement Centre with a view to elevate it a Centre of Excellence. A budget has been prepared to meet the expenses for the same for the financial year 2024-2025.

1. Objectives (2024-25)

Sl No	Objectives
1	Expanding and enhancing the activities of the existing Social Engagement Centre to make it a Centre of Excellence
2	Assisting the scientific and technological programmes of the University to define themselves in terms of sustainability and pragmatic utility for everyday lives
3	Engaging students and their curricula with the communities.

2. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1.	Community Participation and Role of Stakeholders in the Management and Use of Waterbodies: A Case Study of the Involvement of Women and SC population in Pothencode Panchayat (Pilot study is completed with interviews of elected members of the Pothencode Panchayat and members of Ayalkkoottam and Kudumbashree. This empirical study is carried out with a view to combine the digital technology with community requirements and to document in order to replicate in other communities)	1
2.	Digital Literacy and Use of Digital Gadgets: Trend Analysis of Women across age and communities (Initial interaction and a round of field visit are completed with the stakeholders)	1
3.	Water Bodies Preservation and Management (Other stakeholders involved-HarithaKeralam Mission, MGNREGS, Dept of Minor Irrigation, Kudumbashree, Pothencode Panchayat)	1
4.	Geospatial Mapping of Thettiyar in the Pothencode Panchayat (Centre for Geospatial Technology and C.V. Raman Centre of Ecological Informatics, DUK)	1

5.	Library cum Janasevanakendram for a colony predominantly inhabited by the Scheduled Caste population in Ward No 9 of Athiyannoor village	1

3. Outcome of the Research Projects (2024-25)

Sl No	Outcome
1.	One common outcome is ensuring the coordination of stakeholders and making them sit together and discuss the problems and their solutions
2.	Second one is enabling students of technology and business studies to identify a problem in the everyday lives of common people by engaging with them
3.	Documentation of the issues identified by the Social Engagement Centre which can be used as reference document for the implementation of policies related to the areas
	Project-wise outcome
1.	Waterbodies: Opportunity to identify the stakeholders and their role in the preservation of waterbodies
2	Finding solutions to the water scarcity in the rural locale that has a lot of waterbodies
3.	Mapping of waterbodies using geospatial technology and drone
1.	Digital Literacy: Imparting digital literacy to the population surveyed for the project, using the student volunteers
2.	Documentation the trends in digital literacy and use of digital gadgets across communities, income groups and gender.
3.	Draft policy document on digital literacy can be released that can be used for the implementation of digital literacy policy of the government

4. Planned Activities (2024-25)

Sl No	Planned Activities/Target	In Units
1.	Research	2
2.	Networking	Numerous
3.	Publications	5 publications
4.	Community engagement of students	For all PG programmes

5. Project Phasing (Year Wise)

Sl No	Description	Year Wise
1.	Acquiring and establishing the manpower and infrastructural requirements; Actively networking with the industry and local self-governing institutions	2023-2024
2.	Institutionalising the social engagement activities with a view to benefit the student community	2024-2025

3.	Establishing the linkages with the industry and communities at the grassroots.	2025-2026

13. Outcomes of establishing the Centre of Excellence in Social Engagement (2024-28)

Sl No	Outcome
1.	Help create a socially responsible technology and business professionals
2.	Help create a model curriculum taking the latter beyond the classrooms to the communities and the industry
3	Making sustainability, equity and justice as important components in DUK vision
4.	Benefit all the stakeholders-DUK students and communities as part of the community engagement and interface with technology; the local and self-governments will benefit in terms of policy perspectives emerging as the final outcome.

14. Detailed Description of the Activities for the year (2024-25)

Sl No	*Description*
1	Research Project- I 1 Completion of the Primary phase of the project. 2. Draft report of the primary phase will be made available 3. Clear cut indication of the role of the community and stakeholders in the water management of the 4. Preliminary policy document may be made available the government on local management of waterbodies 5. Second phase of the project will begin considering the spread of water management initiatives in other villages 6. Workshop with all stakeholders including the government
2	Research Project- II Draft report on digital literacy and use of digital gadgets across genders and communities Second phase on Policy on digital literacy and empowerment of marginalised sections can be prepared Workshop with scholars and stakeholders before the preparation of the final report Research papers (2 nos)

- If it is Women related Scheme: Women form the most important segment of the study and the project across communities and income. Since women from the marginalised communities also will be clubbed along with women of other communities, more than 50 percent of the funds will be allocated for the causes that will benefit women.
- If the scheme is related to SC/ST: The planned project is related to the marginalised communities and in the field chosen by the Social Engagement Centre, it is mainly the Scheduled Caste that is

marginalised and need more assistance in terms of research and further actions. If the proposal gets funding, 50 percent of the funds will be allocated for SC related activities.

Financial Outlay

Sl No	Centre of Excellence in Social Engagement	Financial Outlay (Rs in Lakhs)
1	Infrastructures- Setting up of lab, Hardware, Software and Computing	5.00
2	Research & Development Expenses	15.00
3	Faculty Cost	5.00
4	Course & Other Expenses	20.00
5	Overhead Charges	5.00
	Total	**50.00**