

BEST PRACTICES OF KITS – 2019-20

Best Practice 1

1. Title of the Practice

ESTABLISHMENT OF TECHNOLOGY MISSIONS IN EMERGING AREAS OF SCIENCE AND TECHNOLOGY

2. Objectives of the Practice

1. Capacity building and awareness creation among the faculty and students on emerging areas of science and technology
2. To apply emerging tools in focal areas of research in Karunya, namely Water, Food, Health Care and Renewable Energy
3. To come out with projects, papers, products, patents and consultancy works in these emerging areas
4. To collaborate with national and international communities, both academic and industry, and thereby to contribute to science and technology in these areas
5. Application of modern technologies to address societal issues related to health, food and nutrition, water and water treatment, generation and distribution of renewable energy and sustainable technologies to meet the everyday requirements.

3. The Context (150 words)

As part of Industry 4.0, technologies like Data Analytics, Cloud Computing, Artificial Intelligence, Machine Learning, Block Chain, Deep Learning, Sensor Application, IoT and IoE have become part of the curricula and syllabi of almost all engineering branches, science disciplines and social and management studies. But, its practical application has been slow to come in the country in general and this region in particular. Therefore, the need for a Mission mode operation to address the practical application of these modern technologies in the areas of Water, Food, Health Care and Renewable Energy has been recognized. The lessons learnt by the application of these technologies in advanced countries can be introduced in India through collaborative ventures leading to joint research, paper publications and patenting. In this context, the main thrust has been to apply the modern tools of applied mathematics, computer science, and electronics in areas like agriculture and food sciences engineering, medical and health care sciences and renewable energy. Apart from this, some of the technologies for making use of the indigenous strengths of the country also has been explored through these technology missions. Also, the environmental implications of development have been addressed through a few of these technology missions.

4. The Practice (400 words)

Considering the importance of exposing the students and faculty to the modern technologies and to come out with projects, papers and products in these areas, which are having societal importance, KITS identified 25 Technology Missions in which faculty and students involve with an aim to contribute to science and technology and to the society. These Missions have emphasis on modern technologies relevant to industry and development. Most of these Technology Missions are expected to address problems relevant to the focal areas of societal importance identified by Karunya, namely, water, food, health care and renewable energy, with the application of modern tools available in science and technology.

Of the 25 Technology Missions identified, six are in the area of Agriculture and Food Processing Engineering, such as, Smart Technology for Precision Farming, Technology Mission for Food Security, Indigenous and Herbal Medicine, Millets for Nutrition and Drone Technology for Agriculture. These Technology Missions are meant to address issues related to agriculture, food and nutrition security, which are highly relevant to the country. These Missions are driven by the Agriculture and Food Processing Engineering Departments of KITS. Two of the Technology Missions deal with Water, a thrust area of KITS, these Missions being Water Treatment and Desalination and Wetland Conservation. These Missions are initiated by the Water Institute of KITS. Four Technology Missions deal with the application of emerging tools in the area of water and agriculture, these tools being Small Satellites, Isotopes, Remote Sensing and GIS. These are initiated by the Agriculture, Aerospace, Chemistry and Civil Engineering Departments. A separate Technology Mission addresses the problems of rural population, especially in the context of Sustainable Development Goals.

Four Technology Missions deal exclusively with the Health Sciences, namely Vaccinology for Viral Diseases, Stem Cell Research, Nanotechnology for Health Care and Medical Devices. These Missions are led by the Departments of Biotechnology and Biomedical Engineering. Health Care is a focal area of research at Karunya.

Three Technology Missions of KITS deal with energy and manufacturing, such as Green Energy, Green and Sustainable Manufacturing and 3-D Printing and Additive Manufacturing. Two Missions deal with habitat, namely, Smart Intelligent Buildings and Smart City. These Missions are spearheaded by Civil, Mechanical and EEE Departments.

The remaining Missions deal with the modern tools and their application, such as, Data Analytics and Block Chain, Cyber Security Knowledge, Machine Learning Technologies for Societal Problems, Smart Vehicle Mission and Robotics in Everyday Life. These Missions are initiated by Circuit Engineering and Robotics and Automation Departments.

Each of the Missions has enrolled faculty and students and set targets for the coming two years. Papers are published in these areas, products developed and patents filed. The Mission mode functioning has created a new vigour among the faculty and students.

5. Evidence of Success

After the introduction of this best practice, the review has shown spectacular results in each of the 25 Technology Missions introduced. These reviews were conducted with targets fixed for a period of one year; the targets and results are given below:

Sl.No.	Particulars	Targets	Achievements
1	Awareness Programmes/Seminars/Workshops	25	42
2	Project Proposals	25	7
3	Research Publications	25	37
4	Products and Patents	25	6
5	Collaborations (National)	25	28
6	Collaborations (International)	25	16

The reviews show that the Mission mode has created a new vigor in delivering the results as per the targets fixed. The results obtained are more practical oriented and capable of solving societal problems.

6. Problems Encountered and Resources Required

The major problems encountered are due to the lockdowns caused by the COVID-19 pandemic. Time and again the area, where KITS is located, was subjected to containment. The faculty, scholars and students had to often work from home.

The funds were made available by the University under the short-term research grant to the faculty and students apart from the funding from Boston Children's Hospital and the funding of large projects are also made use of. Many of the faculty members have already approached national and international agencies for funding to carry out the activities of the Technology Missions during the second year.

Best Practice – 2

1. Title of the Practice

ESTABLISHMENT OF KARUNYA INNOVATION AND DESIGN STUDIO

2. Objectives of the Practice

1. To mould the student community with necessary knowledge and awareness on invention and innovation and to help them in incubating their start-ups in the state-of-the-art laboratories of Karunya through the intervention of the Cell
2. To streamline the teaching and learning process based on the revised syllabi with stress on product development
3. To expose the student community to industrial practices by the industry trained faculty and experts from industries with the facilitation of the cell
4. To take up the activities envisaged by ARIIA to make the student community oriented towards incubation, entrepreneurship and initiating start-up
5. To uphold the vision of the country in line with *AtmaNirbhar*, leading to ‘Make in India’
6. To initiate the establishment of a Technology Park by the Institute for the mutual benefit of the Industry and Faculty-Student community.

3. The Context

The entire education system in the country and abroad is undergoing a great change with stress on hands-on training instead of purely theoretical treatment of the subjects. In this context, in line with the directives of the MHRD, UGC and AICTE, the KITS recognized the need to revise its syllabi giving more stress on invention, innovation and product development. In order to achieve this goal, the need for establishing Karunya Innovation and Design Studio was realized. The purpose of KIDS is to hand hold the students and introduce them to more practical oriented, socially relevant and product-based teaching and learning process. The ARIIA initiative as well as *AtmaNirbhar* vision have been the stimulant for KITS to initiate this practice.

4. The Practice

Karunya Institute of Technology and Sciences – Deemed-to-be-University has embarked on a mission to revise and revitalize its curriculum and syllabi with a focus on product and process development, entrepreneurship and critical problem-solving techniques. Programmes and courses that have global relevance and focus on creating a vibrant environment have been introduced that revolve around product development with social relevance. Choice Based Credit System has been one of the first steps in this direction. The Institute has developed technology driven and skill-oriented courses which are expected to revolutionize the socio-economic development of the country. The main thrust has been on Industry 4.0 with stress on both theoretical and application aspects of Data Analytics, IoT, Artificial Intelligence, Machine Learning and Cloud Computing.

The methodology of teaching has been revisited giving importance to digital teaching and learning and virtual laboratory sessions. KITS has migrated from all the software-based lab sessions to virtual platform. A hybrid of digital and interactive sessions is practiced.

Voluntary, self-study and online courses are also encouraged. Coursera, edX and NPTEL platforms are made use of to obtain the required number of credits for their academic fulfilment. Theory classes with lab components are conducted in the laboratories to help in an on-the-spot demonstration. Courses which are socially relevant in the thrust areas of Karunya, namely, Water, Food, Health Care and Renewable Energy are included in the curriculum and students are taken to the rural areas to address various problems related to the livelihood of people in these focal areas.

The students are encouraged to participate in Hackathons, competitions, seminars and workshops along with in-house add-on programmes to equip them with the art of product design and development. To fulfill all these, KITS established Karunya Innovation and Design Studio which conducts workshops and training programmes which sow the seeds of innovation in the minds of students.

The quality assessment component has been one of the techniques used to evaluate the case studies, concept papers, model preparation and mini-projects done by the students. Due weightage is also given for the papers, patents and products that emanate from the projects done by the students during the course or at the end of the final year of the programme.

5. Evidence of Success

Regular reviews are conducted to monitor and evaluate the success rate with regard to the targets set. The targets set and results obtained for the past year are given below:

Sl.No.	Particulars	Targets	Achievements
1	Awareness Programmes/Seminars/Workshops	5	5
2	Awards/Recognitions for Research and Innovation	150	138

The results show that the introduction of the practice has paid its dividend.

6. Problems Encountered and Resources Required

The major threat encountered in progressing with the practice has been the lockdowns and containments introduced as part of COVID-19 pandemic, which often prevented the faculty and students from coming to the office.

In line with the National Innovation and Startup Policy 2019 of MHRD, a policy has been drawn up to help the students and faculty members to become entrepreneurs and to initiate startups. Students are groomed and trained in ideation, prototype development, commercialization, pre-incubation, start-up registration, attracting funds and setting up a full-fledged firm. Karunya Innovation fund is created to support financially viable ventures. An Innovation Park has been envisioned to be set up in the campus.