

IUCEE STUDENT PROJECTS ORIENTED FOR PROBLEM BASED LEARNING (POPBL-2021)

Project Definitions

IUCEE Foundation Student Development Programs brings a unique opportunity to its' students to get involved in doing engineering projects inspired by real time challenges faced by local and regional industries in crafts and agro space.

IUCEE invites Students to take up these projects as their PBL activity.

The Project is divided into 5 phases

- **Problem Statement**: Preliminary findings and Abstract submission (26th August 2021)
- **Explore**: Critical Thinking of various possibilities this problem can be solved within the constraints of design and functionality. There could be diverse models, depending on the need and local resources
- **Ideate**: Creative lab model prototype on paper and/or by CAD
- **Evaluate**: Lab Trials and Results and Analytical Conclusion
- **Launch**: Paper submission (15th November 2021)

Deadline for submission of preliminary findings and Abstract: Thursday, 26th August, 2021

Cash Prizes will be awarded to best Paper submissions during IUCEE Annual Student Forum January 2022

Papers could be published as UG research

Possibility of IP rights and patents

All reasonable submissions will be given certificates.

PS: This competition is an excellent example of how engineering students can obtain a holistic and multidisciplinary education as required by NEP 2020 Guidelines using the Problem Based Learning pedagogy

I – LOW COST, FIELD TESTING KITS FOR HONEY QUALITY & STANDARDS

Background

The lab testing of quality and standards of honey is very expensive. Each lab establishment can cost in a range of 5-10 crore. This results in adulterated and poor-quality honey penetrating and dominating the market and loss of market share for genuine honey supplier brands.

Project Honey

Develop an On-Field Low-Cost Testing Kit that can provide an equivalent substitute to lab testing or a preliminary rapid checking of quality standards before the samples are sent to Lab testing.

- **Preliminary findings:** Study the existing conditions and methods of Honey Testing in India and other countries. Collect data based on their geographical regions, sources, types & methods of honey extraction, processing, testing, and packaging methods and cost involved at every stage. Provide a reference data of parameters being tested of honey sourced in different regions of India and their acceptable range for purity guarantee
- **Abstract Submission:** Prepare a chart (tabular, graphical) to present your data and **your analysis of the data**
- **1st proto-type** field testing kit: A Sample working kit that can test multiple samples of 1 type of honey at a cost of INR 25,000 – 50,000 at a rate of 100 samples in 10 hours
- **Paper Submission** by 15th November 2021: A well written UG Research paper detailing the findings, purity standards and their levels of quality checks, data collection, data analysis, Kit development, Sample testing and comparison with existing kits for purity and cost trade-off. Conclude with results of the samples tested and the proposition for the low cost field testing kit based on the condition prescribed above.

II – DISTILLATION UNITS FOR ESSENTIAL OILS

Background

In the process of Essential oil distillation, there is a loss of heat & constant temperature levels are not maintained, resulting in drop in oil extraction. The Distillation material used does not provide stable thermal efficiency. The quality of the fuel used in heating and the fluctuating temperatures are the identified cause of problem.

Project Essential Oil

Propose (more than one) ways to improve the efficiency of the essential Oil Distillation process by $<0.6\%$. General productivity standard for oil recovery is 0.6% , although it can up to 1.2% . Sun drying, Fuel quality and time of harvesting are some of the factors impacting the efficiency of the oil extraction.

- **Preliminary findings:** Study the existing steam distillation, methods of oil extraction and monitoring methods. Understand the effect of heat treatment on the characteristics and the efficiency of the oil being extracted. Study alternative (i) materials and (ii) possible bio-fuels that can improve the efficiency
- **Abstract Submission:** Prepare a chart (tabular, graphical) to present your data and your analysis of the data
- **1st proposal:** A Paper presenting the Experiment Data supported with evidence and results and its analysis from your College Lab. The lab results should highlight the impact of alternative (i) materials and (ii) possible bio-fuels on improved (by 0.5%) extraction efficiency of the oil
- **Paper Submission** by 15th November 2021: A well written UG Research paper detailing the findings, Sample testing and comparison with existing methods and their cost trade-off. Submit a clear proof of achieving $<0.6\%$ efficiency. If the efficiency improvement experiments fail or you face challenges in achieving the required efficiency, please document those as part of your paper submission. Failed experiments will be accepted as well as successful experiments provided the teams are able to submit coherent data.

III – TOYS FOR AUTISTIC KIDS

Background

The market caters to high volume of consumers and hence most toys are made for a “normal” average individual. The toys are mostly designed to cater only to a certain age group of children and may or may not prescribe to the stimulation needs of an autistic child.

Project Toy for Autism

Design a Toy or a Game that can help improve the concentration ability and provide stimulation to an autistic child less than 16 years old. The design can be designed to suit a smaller age range anywhere between 2 years to 16 years. It could be a single or a multi-player toy that can help an autistic kid to deal with their weakness and/or improve their cognition within the spectrum of a normal child.

- **Preliminary findings:** Study the Autism behaviour patterns of a kid. Understand what triggers and which responses differentiate and isolate an autistic kid from a non-autistic kid. Collect data of several studies conducted among Indian population to identify the above said responses and their impact on their life and personality development. Prepare a list of Institutions and Agencies working on this.
- **Abstract Submission:** **Prepare a chart** (tabular, graphical) to present your data. **Prepare a survey Form/Questionnaire** that you will send out to Experts and Users and affected population. The purpose of this survey is **for you to receive enough responses that can help you to design a Toy** based on above recommendations.
- **1st proposal:** A Paper/CAD design of the Toy supported with experimental evidence. Back your Toy Design with the scientific understanding of the impact on the Autistic kid
- **Paper Submission** by 15th November 2021: A well written UG Research paper detailing the findings, design and development. Sample testing (if possible) and comparison with existing methods and their cost trade-off for affordability and high volume of use. Submit a clear proof backed by opinions from at least two or more experts to validate your proposal.

IV – (WASTE) MANAGEMENT OF PERISHABLE FRUITS & VEGETABLES

Background

The perishable fruits and vegetables incur heavy losses to the farmers and suppliers due to their low shelf-life

Project Fresh produce

Identify ethical and environmentally sustainable solutions to prolong shelf-life of fresh produce, organic methods to utilise the excessive produce and also ways to manage the waste produced due to transfer and storage

- **Preliminary findings:** Study (in India) the demand and supply of perishable fruits and vegetables based on time, season and region of harvest, transport and distribution, packaging and shelf-life. Find what causes maximum loss to the farmers and distributors and why. Collect data for current conditions that exist to preserve, utilise items and waste generated and treated. Understand natural farm-based preservation methods based on traditional knowledge systems.
- **Abstract Submission:** **Prepare a chart** (tabular, graphical) to present your data. **Prepare a survey Form/Questionnaire** and collect data from Experts and Users and affected Suppliers. **Provide analysis of the data** collected, root causes and the variability in the nature of the problem
- **1st proposal:** A Paper presentation on the primary and secondary challenges and possible solutions which are ethically sound and environmentally sustainable, affordable. The solutions should be more aligned to traditional and local sensibility of the farmers
- **Paper Submission** by 15th November 2021: A well written UG Research paper detailing the findings, design and development. Sample testing (if possible) and comparison with existing methods and their cost trade-off for affordability and high volume of use. Submit a clear proof backed by lab results on few samples of fruits and vegetables and their prolonged shelf life and/or preservation and handling of the waste generated.

V – BLOCK CHAIN MAPPING OF PRODUCTS

Background

Currently the product database and supply chain links, quality checks, personnel movement tracking, resource engagement are not centrally controlled and monitored. Hygiene factors, tracking of raw material, purity, adulteration issues and unethical practices like child labour concerns exist. Need of the hour is to track product to market value chain, to ensure fair value to the farmers, eliminating dependency on human agents in the chain and linking product maker to the customer on a fair transparent digital platform.

Project Blockchain mapping

To establish tracking and database management from origin to end-user. Bring source of origin, material, procurements, supplies, personnel on App with geo-tagging, block chain or, other tools

- **Preliminary findings:** Study one particular (local) agro or handicraft industry in detail. Identify the entire development cycle from material procurement and source to the end-user marketing and supply. Mark out all dependencies and points of handover across multiple entities involved in the chain. List out sources of personnel and their work conditions.
- **Abstract Submission:** Prepare a chart (tabular, graphical) to present your data. Present a mapping across multiple sectors and their inter-dependencies. Present existing Apps, Block chain or Geo-tagging features that can be roped in. Elaborate all challenges, risks, failures and threats to a transparent and fully mapped chain.
- **1st proposal:** A Paper presentation on the above mapping identifying the various stages and simplifying the QR coding and Barcoding method. Provide sustained and permanent solutions to the challenges/limitations of the local infrastructure and facilities, network connectivity along the entire supply chain. The suggested approach should exhibit zero tolerance to challenges posed.
- **Paper Submission** by 15th November 2021: A well written UG Research paper detailing the findings, failure modes, design and development of blockchain mapping. Provide a working solution with zero tolerance to failures and risks backed by a sample case study