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Criteria – II Teaching - Learning and Evaluation

Metric:

2.3.1 Students Centric methods such as experimental learning, participative learning and Problem Solving Methodologies for enhancing learning experiences

Contents

1. **Students Centric Methods – Forge, Sprout**
2. **Engineering Clinic Report**
3. **Project based Learning Handbook**

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Criteria II:
Teaching-Learning and Evaluation

2.3 Teaching- Learning Process

2.3.1 Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences.

FORGE is the incubation enterprise launched by the CIBI, founded with the vision to create & catalyse innovation powered enterprises that harness the power at the intersection of hardware, software, and computing technologies to solve real-world problems, creating economic gains and delivering social impact.

- FORGE FACTORY the 20,000 sq.ft incubator established in Coimbatore, includes HW junction the fully integrated lab for full-spectrum hardware innovation offering equipment, tools, and resources in computing (AI/ML), IoT, electronics, desktop fabrication, 3D printing, drones, and automation & robotics, to support the design, testing and development of manufacturing ready prototypes.
- **ProtoSem** is a first-of-its-kind program launched by FORGE that embeds an innovation centred approach to engineering education right into the core of the engineering curriculum. It is offered as a 20-week intensive process of prototype design and development aimed at comprehensive skills and competencies development. Students will immerse in deep problem validation, customer discovery and continuously validate their innovative idea and with the guidance of industry experts design prototype to test permanently deployable solutions. In this process, the students will also learn core technical concepts and develop key engineering skills

Fig.2.3.1 Forge Factory

Fig.2.3.2 Student working on real time products

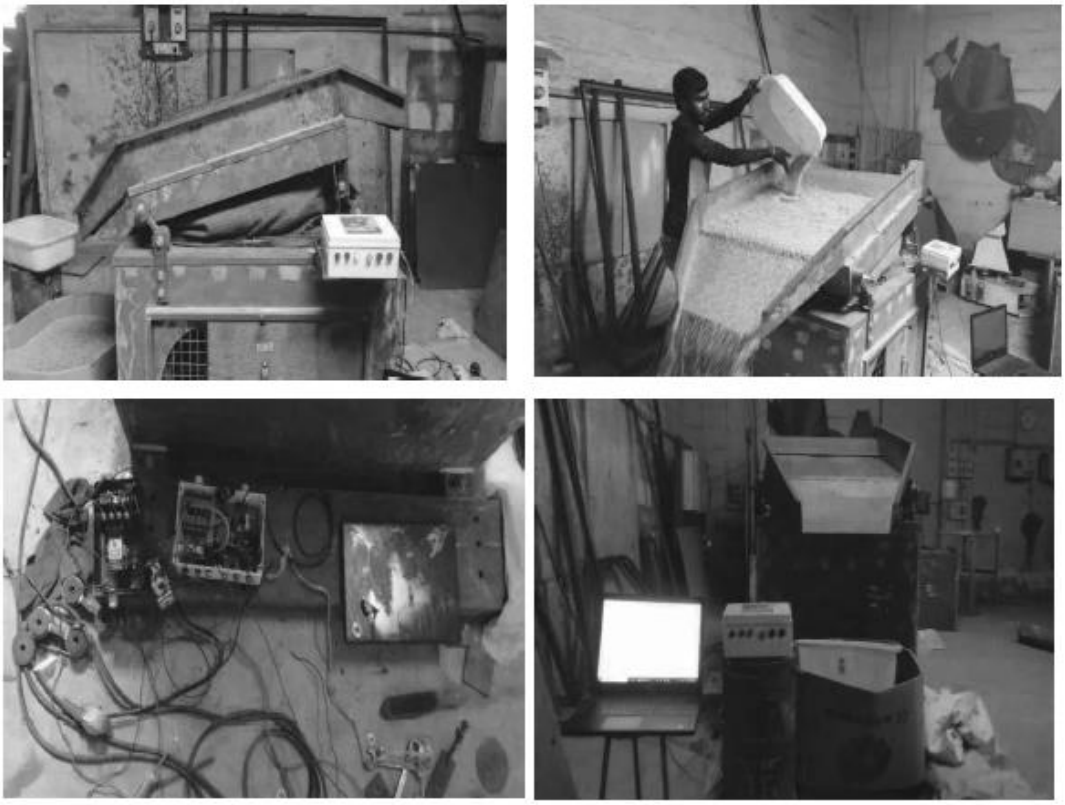

Fig.2.3.3 Sample Case of Prototyping & Product Development in Forge during ProtoSem by Mr. Kaushik S. B (15BEI025) from E&I during his Third Year of Study

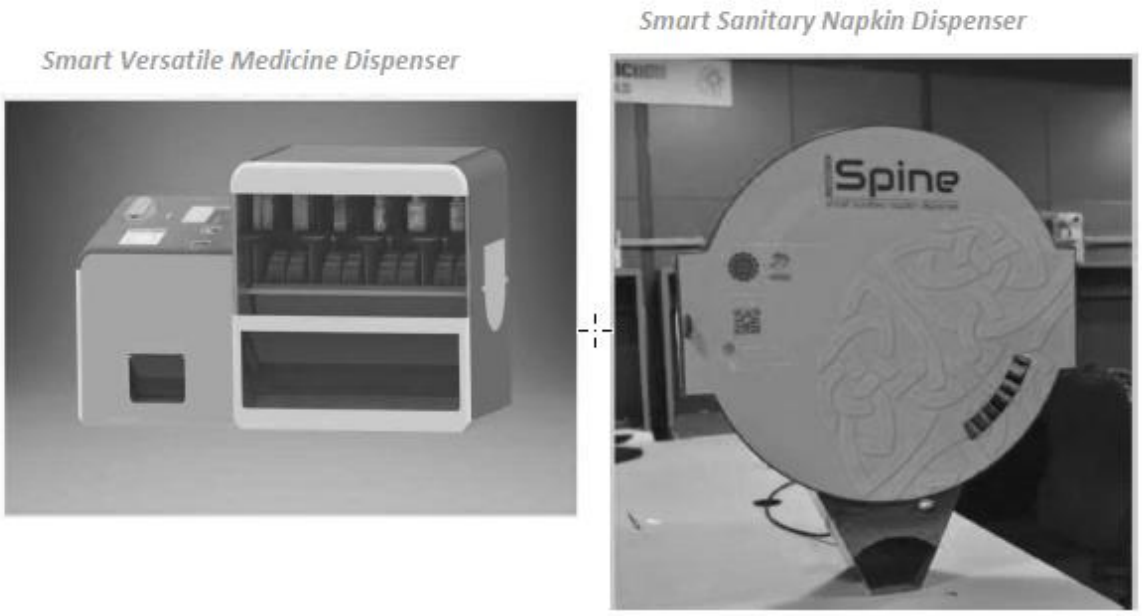

Fig.2.3.4 Sample Cases of Prototyping & Product Development in iQube

by Ms. Sharmila and Ms. Muthuperiyaval (15BEI026) & Ms. Harshavarthini (15BEI003) from E&I during their Final Year of Study

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Peer learning

Sprout is the passionate career enhancement initiative of Kumaraguru College of Technology where alumni and seniors share topics in their fields of interest and expertise their juniors and fellow mates while exploring possibilities as a peer learning community.

Source: Linkedin: Profile link Facebook: Page link Instagram: Page link

Sprout Programs from 2019

Year of implementation	Name of the capability enhancement scheme	Number of students enrolled	For more information
2019-20	Intelligent Transport Asset Management practises to aid Sustainable Development and Higher Education abroad	30	https://www.instagram.com/p/B-jlXJGpAXh/
2019-20	Communication Skills & Other Strategies for Getting Yourself Interview Ready	50	https://www.instagram.com/p/B-kJZOlptx-/
2019-20	Portfolio Building: LinkedIn, Blogs & Other Tools	40	https://www.instagram.com/p/B-pf8eQJYg-/
2019-20	Have you ever played with building blocks? About Branding & Analytics	50	https://www.instagram.com/p/B-wEni6pOWc/

2019-20	Past to Present in Printing 3D	30	https://www.instagram.com/p/CDVnT3JMIvp/
2019-20	Innovation with Diapers - My Startup Journey	40	https://www.instagram.com/p/CDYAw7nME4H/
2019-20	Hands-on Session on Digital Art	40	https://www.instagram.com/p/CD_MC3JsqsZ/
2019-20	What if Machines could think on its own?	30	https://www.instagram.com/p/CEs8PObs8Li/
2019-20	Enhancing our Ecosystem - A Geographical Approach	40	https://www.instagram.com/p/CGXSuMqsYRo/
2020-21	Differential Equations	35	https://www.instagram.com/p/CJgZyhoMCba/
2020-21	Cloud Computing & AWS	40	https://www.instagram.com/p/CLyYJwys62Q/
2020-21	The Wardrobe Series	70	https://www.instagram.com/p/CHNvkZQseMo/
2020-21	The Life Science Series	70	https://www.instagram.com/p/CJxgOtwsa6Z/
2020-21	The Builders Series	70	https://www.instagram.com/p/CMExDOqsteT/
2020-21	Space Engineering & Scope	70	https://www.instagram.com/p/CKyvgGDM82X/
2020-21	Life Hacks	30	https://www.instagram.com/p/CKyvgGDM82X/
2020-21	Sustainable Development	30	https://www.instagram.com/p/CM3xmO7MgLL/

2020-21	Fashion Design & Brand Communication	40	https://www.instagram.com/p/CM3xmO7MgLL/

Fig 2.3.5 Sprout Podcast

Fig 2.3.6 Sprout: Management Series

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Fig 2.3.7 Sprout: The Builders Series

Participative learning - Tutorial

Tutorial hours mentioned in the Curriculum

Semester IV										Pre-requisite
S.No	Course code	Course Title	Course Mode	CT	L	T	P	J	C	
1	U18MAT4101	Numerical Methods and Probability	Theory	BS	3	1	0	0	4	--
2	U18MEI4201	Strength of Materials	Embedded - Theory & Lab	PC	3	0	2	0	4	U18MET3002
3	U18MEI4202	Fluid Mechanics and Machinery	Embedded - Theory & Lab	PC	3	0	2	0	4	--

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Faculty allocation in Timetable

					119/ U18MEI4201L - C119A	119/ U18MEI4201L - C119A		
Tuesday	U18EEI4207T - A 107	U18MAT4101 - A 107	U18EEI4207L - B114A- Electrical Machines Lab I-1/ U18EEI4207L - B114A- Electrical Machines Lab I-2/ U18MEI4202L - C 120/ U18MEI4202L - FM LAB	U18EEI4207L - B114A- Electrical Machines Lab I-1/ U18EEI4207L - B114A- Electrical Machines Lab I-2/ U18MEI4202L - C 120/ U18MEI4202L - FM LAB	U18MEI4201T - A 107	U18INI4600 - CADD LAB A - D Block	U18INI4600 - CADD LAB A - D Block	
Wednesday	U18MEI4201T - A 107	U18MAT4101 - A 107	U18EEI4207T - A 107		U17MENTOR - A 107	U18MEI4202T - A 107	U18MET4003 - A 107	
Thursday	U18MAT4101 - A 107	U18MEI4202T - A 107	U18MEI4201T - A 107	U18CHT4000 - A 107	U18EEI4207T - A 107	U18INI4600 - A 107	U18INI4600 - A 107	
Friday	U18MEI4202T - A 107	U18MET4003 - A 107	U18CHT4000 - A 107	U18MET4003 - A 107	U18MAT4101 - A 107	U18MEI4201L - C 119/ U18MEI4201L - C119A/ U18MEI4202L - C 120/ U18MEI4202L - FM LAB	U18MEI4201L - C 119/ U18MEI4201L - C119A/ U18MEI4202L - C 120/ U18MEI4202L - FM LAB	
Saturday								

Course Code	Course Name	Faculty	Additional Faculty	Credits
U18CHT4000	ENVIRONMENTAL SCIENCE AND ENGINEERING	MAHALAKSHMI R		0
U18EEI4207T	ELECTRICAL DRIVES AND CONTROL	KANDASAMY V		3
U18MAT4101	Numerical Methods and Probability	PRINCY FLORA	ANITHA N	4

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Criteria: II - Teaching - Learning and Evaluation

2.3.1 Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences

S.No.	Description
Engineering Clinics	
1.	Semester 1: Engineering Sprint
2.	Semester 2: Innovation Sprint
3.	Semester 3: Design Sprint
4.	Semester 4: Ideation Sprint

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FORGE
Your Innovation
& Growth Partner

ENGINEERING SPRINT REPORT

1st YEAR | 1st SEMESTER
INNOVATION PRACTICUM

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EXECUTIVE SUMMARY

Innovation Practicum drives the institution's innovation outcomes through a defined process, methods, and frameworks. This facilitates the strengthening of the innovation ecosystem in the Institution, by providing students & educators to build capabilities in innovation, technology, and design. The **Innovation Centric Curriculum** delivered in a **Learner Centric Pedagogy** enables the transformation of students/educators into Innovation engineers/mentors capable of building innovative solutions for real-world problems. This also becomes a playbook for academic Institutions to foster a state-of-the-art infrastructure conventionally termed as **Centres of Excellence** in partnership with Industry through Government funding schemes like Idea Labs**,** with the capacity of transforming an idea into a prototype. The platform essentially helps build a sustainable model to accelerate the number of product innovations, patents, grants, internships, and differential employability outcomes enabled by innovation coaches, startup veterans, technology experts, and industry professionals.

Innovation Practicum comprises a sequence of courses designed at the grassroots levels providing opportunities to identify and harness the real power of technology to solve industrial problems and challenges. It focuses on **Tools, Technology** & **Talent** delivered through Sprints & ProtoSem supported by technical resources, tools, equipment, etc. that are required across the entire spectrum of the innovation process.

Engineering Sprint, as part of the Innovation Practicum, is the course designed & delivered for the first-semester students coming fresh out of their schooling. The curriculum is tailored to introduce the students into the realm of innovation & technology and upskill them across various tools, techniques, and approaches to become self-driven engineers.

By introducing the **'Street Fight Engineering'** techniques, the students are trained to think about real world problems in a way street fighting is carried out: 'No rules. Do anything to come out successful.' With this approach to learning, students' minds turn open to new concepts, learnings and methods.

Enabling students to learn the methods to write **pseudo-codes** with the structured logics, programming paradigm module gives the leverage to think and write programs with any programming languages. This soft launch into programming acts as a very strong foundation for students, we have observed, they are able to easily assimilate complex downstream programming logic and algorithms.

They are also introduced to iterate an **idea from X to X++, Idea Hexagon, a decision matrix** and other tools to help them learn models to bring innovation to the next level, the case-studies from Tesla have given an overview of how 21st-century modern companies are creating new innovations.

To build and understand the man-made systems the students are also introduced to stocks and flow diagrams and identify places to intervene in the systems to make them better. The flipped classroom is adopted to actively engage the student when working in a team and also kindles out-of-the-box thinking.

The course was piloted at Kumaraguru college of technology during the AY 2020-21 for 1000+ students facilitated by 35 innovation mentors.

Metrics that Matter

Program Framework

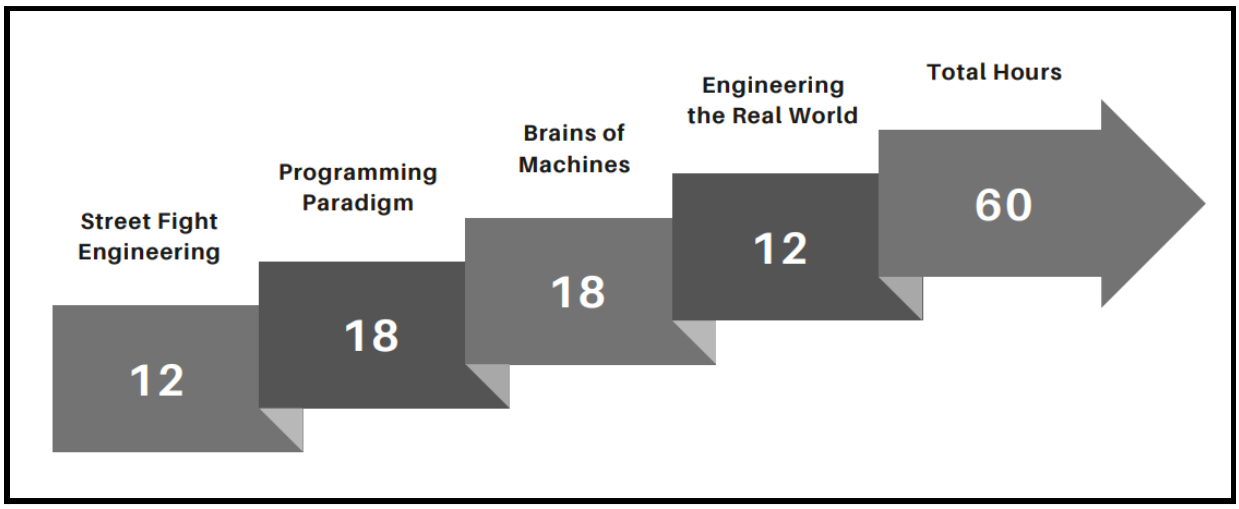
The course aims to strengthen the conceptual understanding of fundamental engineering concepts. Harnessing experiential learning strategies to unlock educational value and spark curiosity in student's minds. The course is targeted towards beginners with little to zero experience. The course shall focus on teaching through a problem-solving approach using Street Fight Engineering principles pioneered by MIT; instead of the conventional approach, and by using self-directed activities that foster the growth of functional independence and self-driven learning. This kind of learning has a demonstrable effect on the candidates' interest levels toward learning - as they aspire to create meaningful change and affect powerful change in the world - enabling them to build solutions that solve challenging real-world problems.

Learning certain tools and techniques to approach real-world problems and to break them down into simple forms to understand the problems and make connections. And it gives the leverage to think and learn independently. The real challenge of programming is not learning a language's syntax, it is learning to creatively solve problems so that we can build something great. The programming paradigm module breaks down the techniques and ways to think like a programmer.

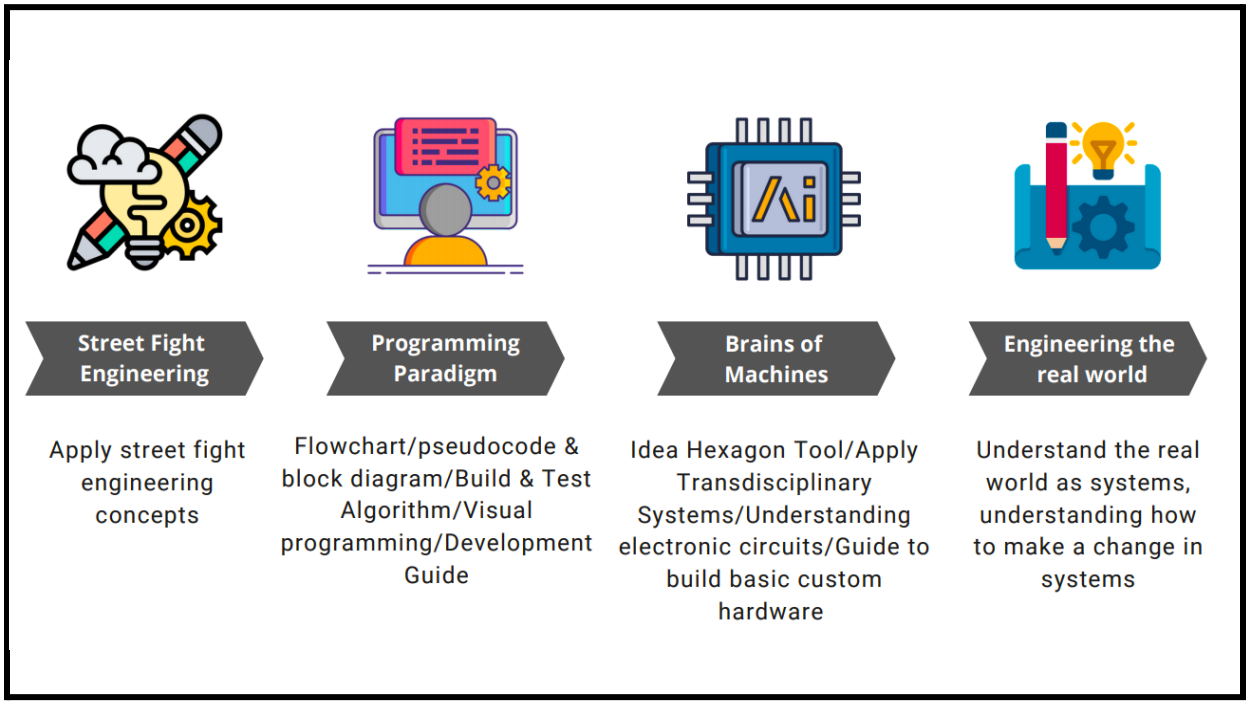
To understand how modern innovations are created the brains of machines and machines that make up the world module gives an overview of how companies adopt transdisciplinary systems to accelerate innovation. Introducing the idea hexagon tool, students will get the knowledge to think and apply new innovations.

Systems thinking module builds on our understanding of natural and man-made systems. It is a set of techniques and an overarching mindset that "problems" can be solved by considering the component's relationship to the overall system and its environment. We will see how day-to-day things we take for granted are parts of the system, and try to understand them by creating stock and flow diagrams, and finding out places to intervene in systems to make them better.

Module Heads & Hours



Course Outcomes



Syllabus

Street Fight Engineering

- Why Streetfight engineering
- How to street fight engineering Decoding real-world problems
- Observing key patterns
- Relationship study
- Deriving actionable inferences
- Performing data-driven insights
- Generating concepts and case studies

Programming Paradigm

- Need for programming
- Outside box thinking to solve problems
- Need for algorithms and data structures
- Flowcharts & Algorithms
- Memory Allocation
- Conditions and loops
- Creating effective functions
- Case studies
- Visual Programming
- Types of programming languages & paradigms
- Getting started with development Build & test an algorithm
- Best practices

Brains of Machines

- Key Innovations in Tesla Electric car
- Case study
- Brains of Electric cars
- Transdisciplinary systems
- Adapting Transdisciplinary systems to Accelerate innovation
- Idea Hexagon
- Exercise to think new innovations using Idea Hexagon
- Brains of Digital camera
- Basic of Electronics Passive Components
- Need for sensors & Actuators
- Analyzing & Understanding electronic circuits How to Build a Basic Custom Hardware Bootloader & its purpose

Engineering the Real World

- Real-world has systems
- Introduction to Systems Thinking Stock and Flow Diagrams
- System Traps
- Intervening in Systems
- Living in a World of Systems

Evaluation Criteria/Methodology

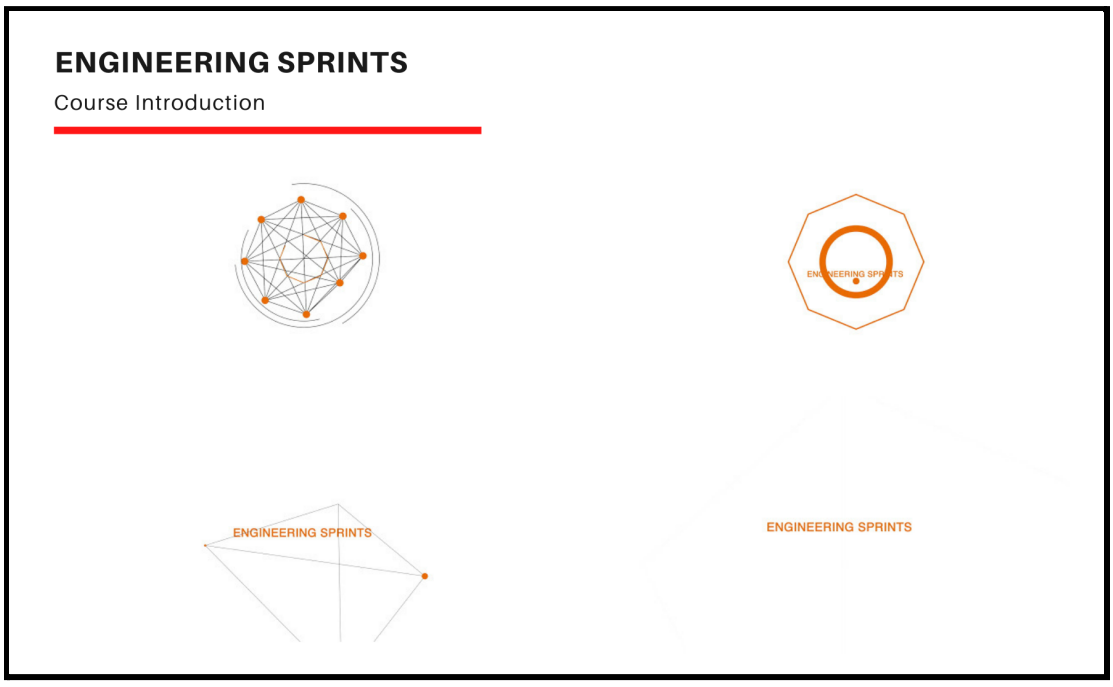
Quiz / MCQ	Assignment	Total
20	80	100

Engineering sprint in terms of Tools, Techniques & Talent (TTT) of Innovation Practicum

	Tools	Techniques/Technology	Talent
Module I - Street Fight Engineering	• Transno	• SEF Techniques • Mind Mapping	• Self-learning methods • Engineering principles - Explore, observe, understand, relate, play • Solving problems & riddle
Module II - Programming Paradigm	• Flow chart creation using visual programming	• Real-time analogy of programming	• Strategies to solve problems • Writing pseudo code • Self-driven concept
Module III - Brains of Machines & Machine that Make-up the World	• Idea Hexagon	• Battery Technology • Self Driving AI brains	• Understanding transdisciplinary system • Understanding how to think new innovation • Analyze, understand and build custom hardware
Module IV - Engineering the Real World	• System representation	• Stock and Flow Diagrams	• System thinking mindset • Designing real world problems as single & two stock flow systems • Understanding System Traps and Opportunities

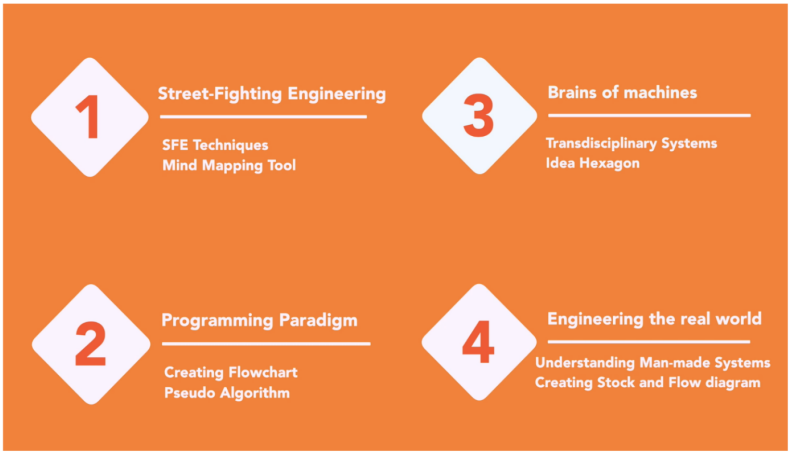
Program Design & Development

All the modules in engineering sprints have been designed and developed to drive the curiosity of engineering among students. By creating a constant design pattern throughout the course module, a striking impression and brand recognition by creating a consistent visual language are created. It also provides an instant connection to the subject matter.



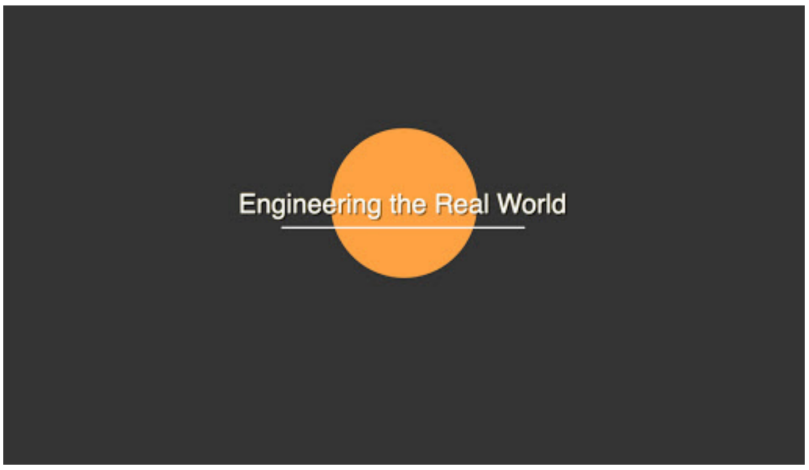
ENGINEERING SPRINTS

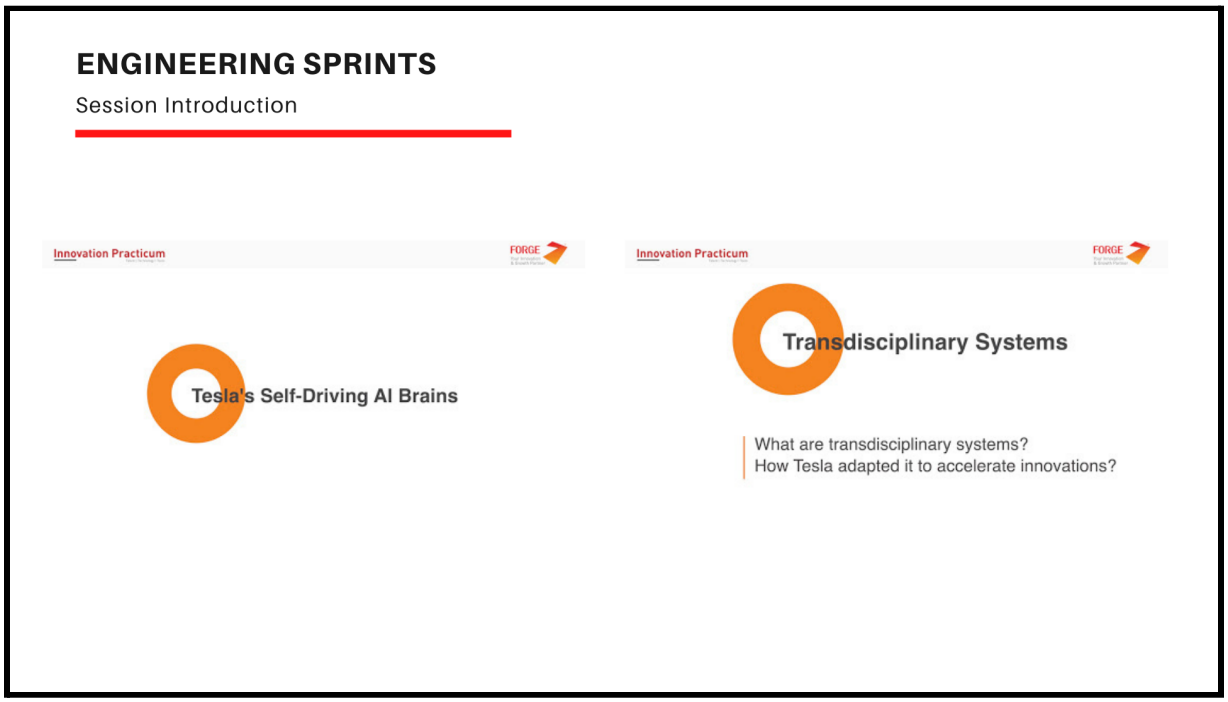
Module brief



ENGINEERING SPRINTS

Module Introduction

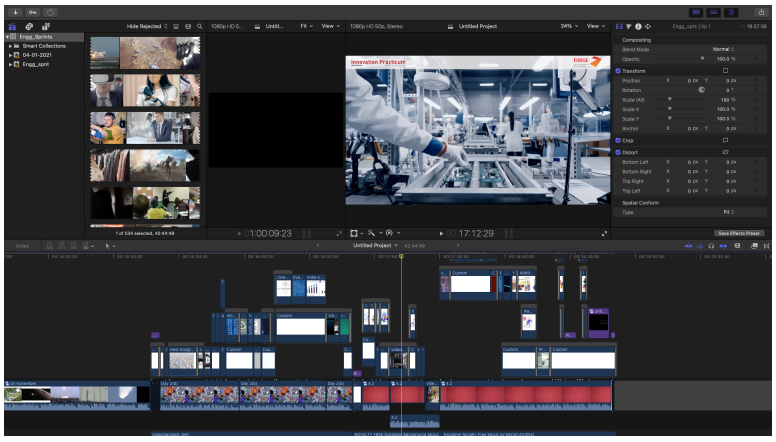




The ultimate goal of the program is to deepen the learning and enable students in gaining core competencies in self-learning methods, understanding transdisciplinary systems, a guide to building custom hardware, a system thinking mindset, stocks & flow diagrams. The engineering sprint pedagogy is an active and student-centered approach resulting in a dynamic, interactive learning environment where the educator/mentor guides students as they apply concepts and engage creatively.

The entire curriculum is designed for self-paced consumption with mentor hours for the students to engage in various learning activities. Teams are structured with interdepartmental students to generate breakthrough ideas and disruptive innovations and product development. Here the educators are transformed into innovation facilitators.

Course Development: All module content has been designed and developed by the team Forge using software like a final cut pro, open Broadcaster, Open Shot, and Adobe illustrator. Some of them are open-source cross-platform streaming and recording program software that was built with Qt and maintained by the OBS Project.

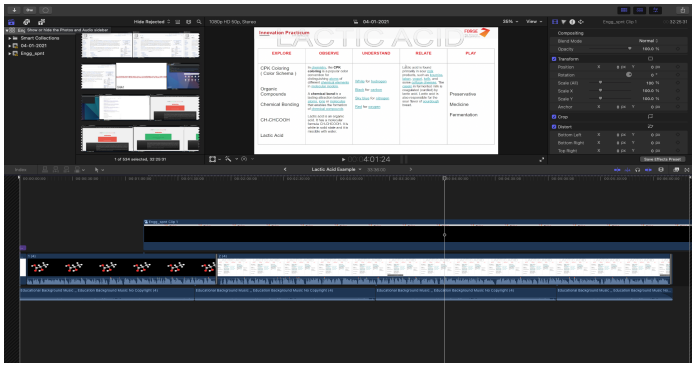


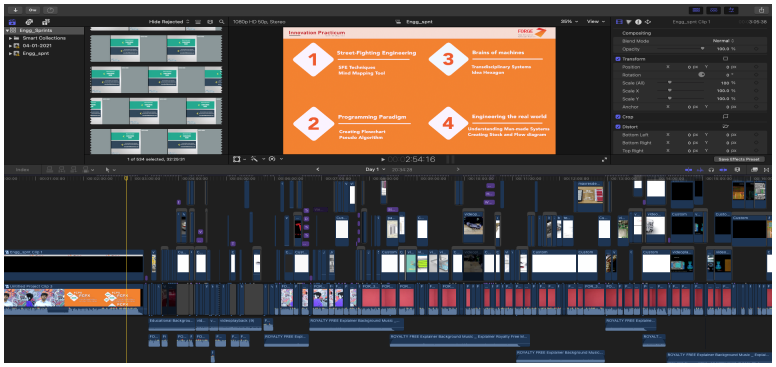
OPENedX

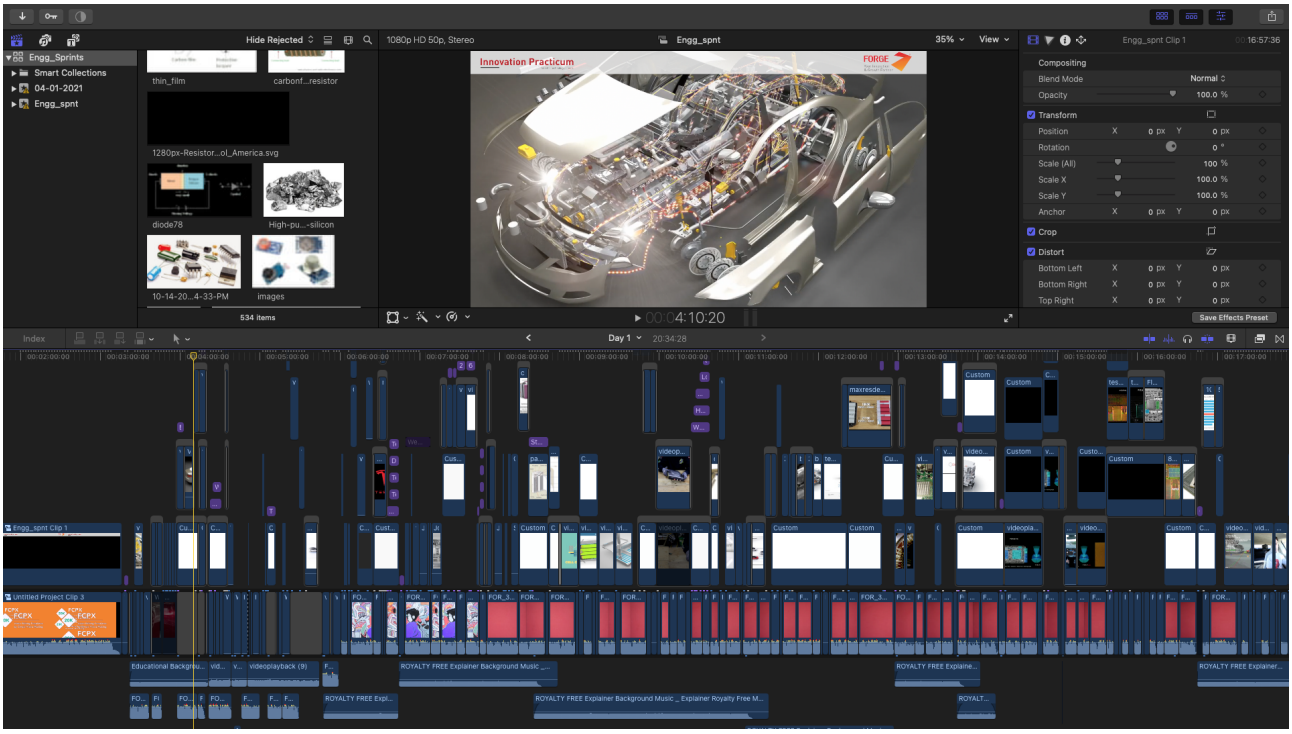
YouTube

Ae
After Effects CC

Final Cut Pro X



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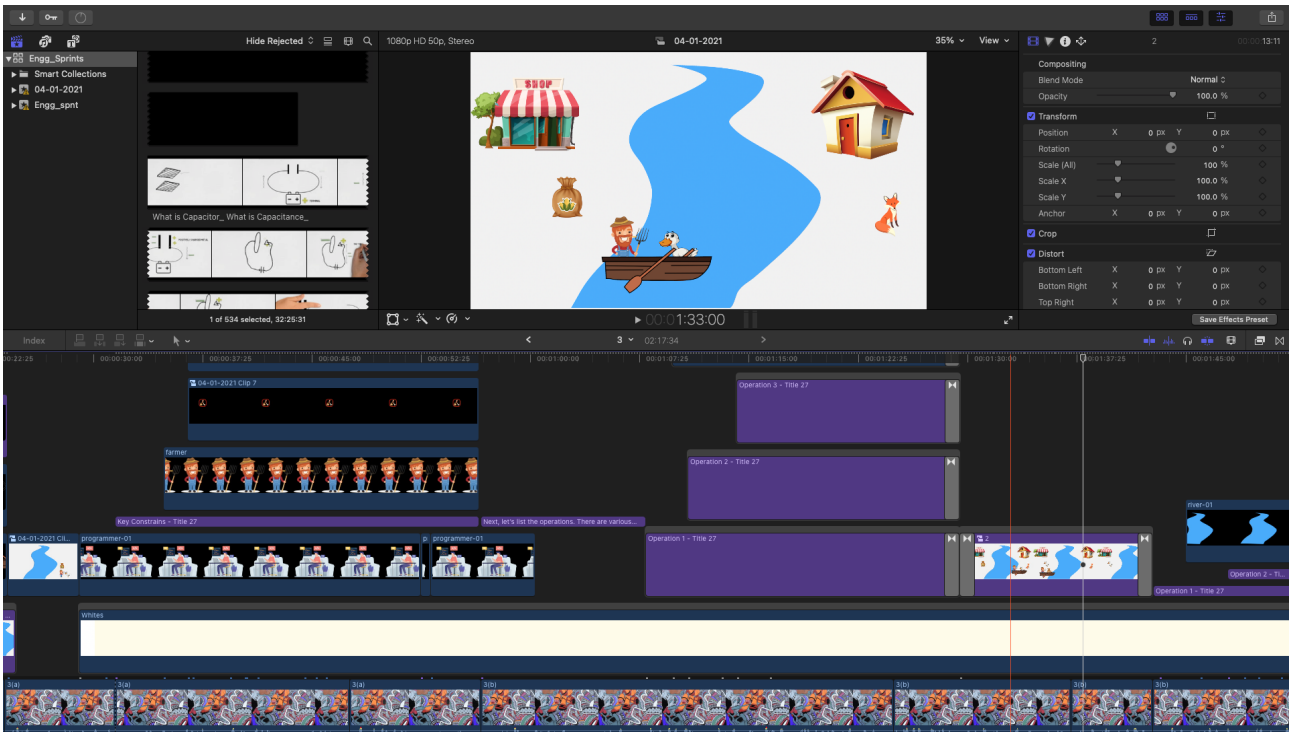
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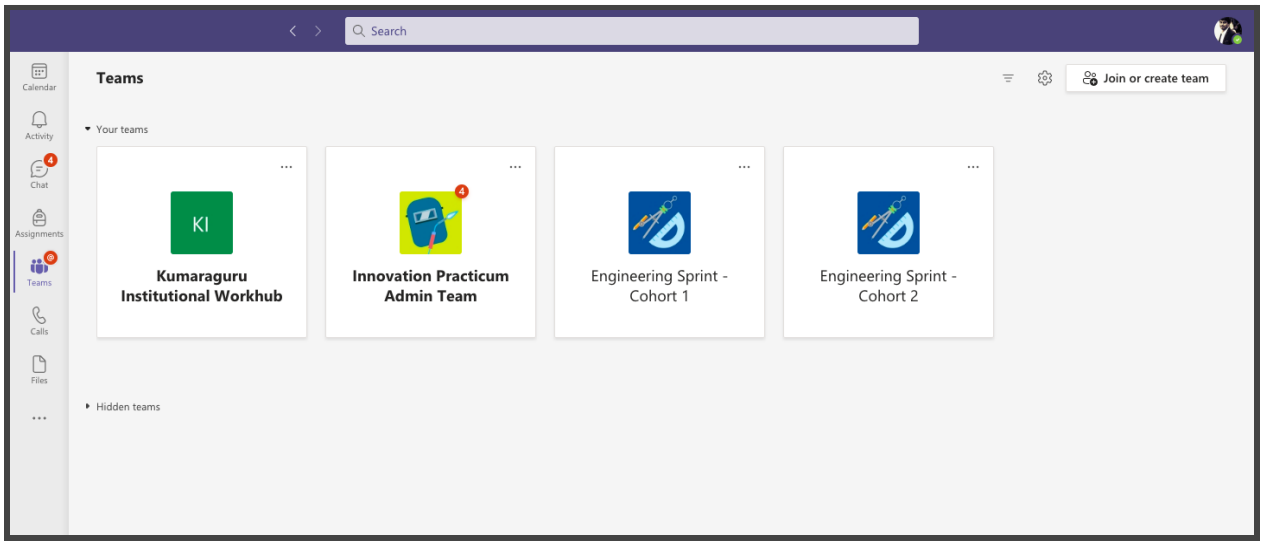
The content delivery was offered through Amazon Simple Storage Service (Amazon S3) which provides object storage through a web service interface and Amazon CloudFront which is a content delivery network. It can be used as a globally distributed network of proxy servers that cache content, such as web videos or other bulky media, more locally to consumers, thus improving access speed for downloading the content. Some of the content was also hosted on YouTube for quick access.

MS Team Set up: Learning about MS Teams through hierarchies, and methods, via documents and online resources, was the initial process involved to understand the effective execution and attaining the outcomes through interdisciplinary mapping of students. An initial setup was made to identify the gaps for implementation. Once the trial was successful, a formal request was initiated with the IT department to create the necessary cohorts for the Sprint and include Forge members, as the class owner. The challenge was to create more private channels for the respective teams and hence the private chats were created for the respective mentor with their students. The mentor-mentee mapping was carried out to have the interdisciplinary teams and they were added in MS Teams with their respective cohorts.



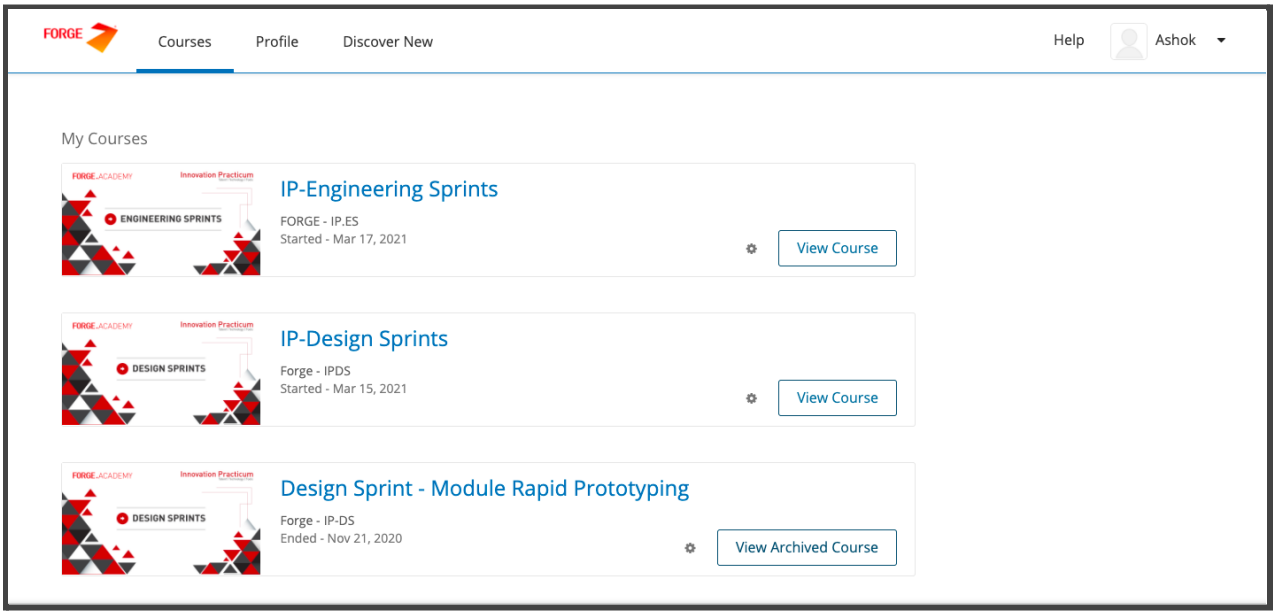
Each Mentor was assigned with 5 to 6 teams with 6 students in a team. All the students with the same mentor were added with the private channel, enabling the mentor to have a common platform for their communication with all their teams.

User Trials with ProtoSem Students: Before producing any product, it is necessary to run a few user trials to get critical feedback. Here while developing the content in the OpenEdx platform, logins with various domains were created for the ProtoSem students to identify the gaps and challenges. Numerous user trials with the students were conducted, tested and issuers were rectified. The user trials include account creation in the OpenEdx platform, authentication of the account, security issues, video streaming, and quality checks, buffering speed and navigation, multi-platform support, and multi-user support for stability.

Learning Management System

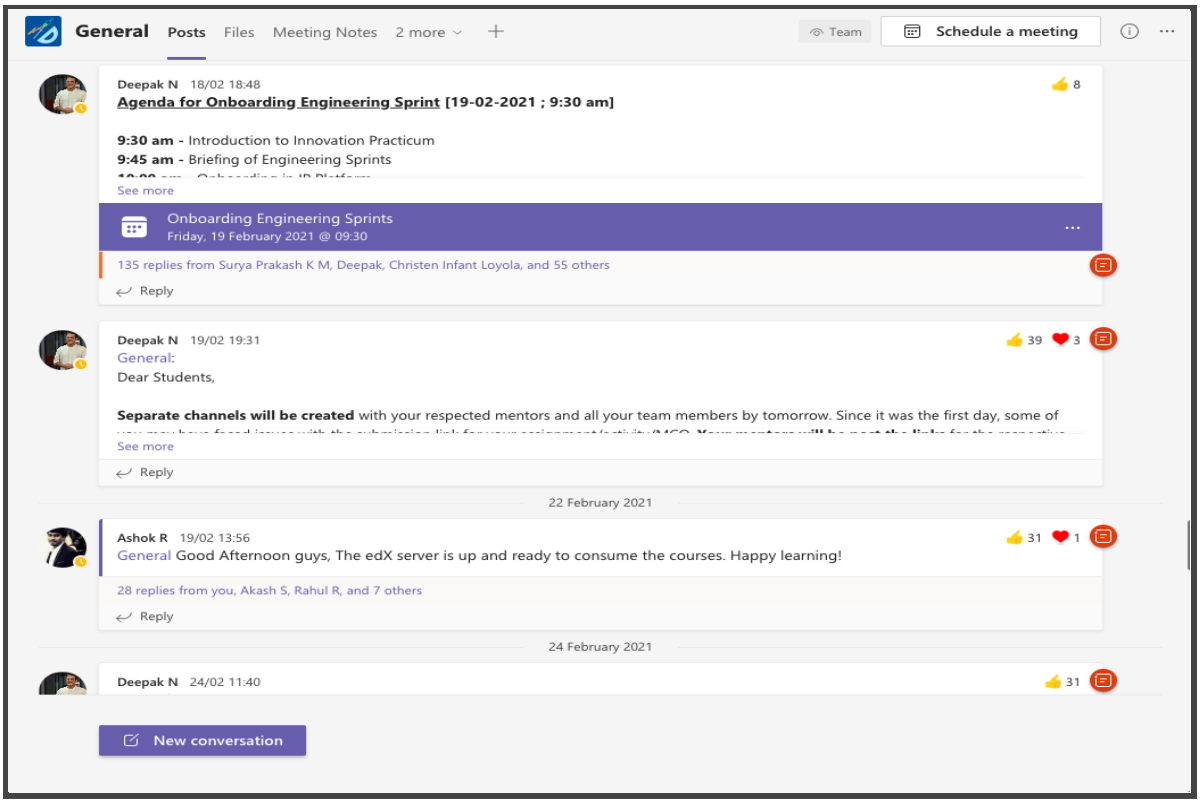
The blended learning for the engineering sprint uses three major platforms like Open Edx, MS Teams, and MYCAMU for administration, mentoring, assessment, tracking attendance, and delivery of educational course content. The learning management system (LMS), is used for both asynchronous and synchronous communications and team management among students.

OpenEdx Platform: The Engineering Sprint course has been developed in an open edx learning management system (LMS) using Studio. The studio is the Open edX tool that you use to build your courses. Studios were used to create the course structure and then add course content, including problems, videos, and other resources for learners. It is used to manage the course schedule and the course team, publish each part of your course, and more. The Studio can be directly used using a browser.

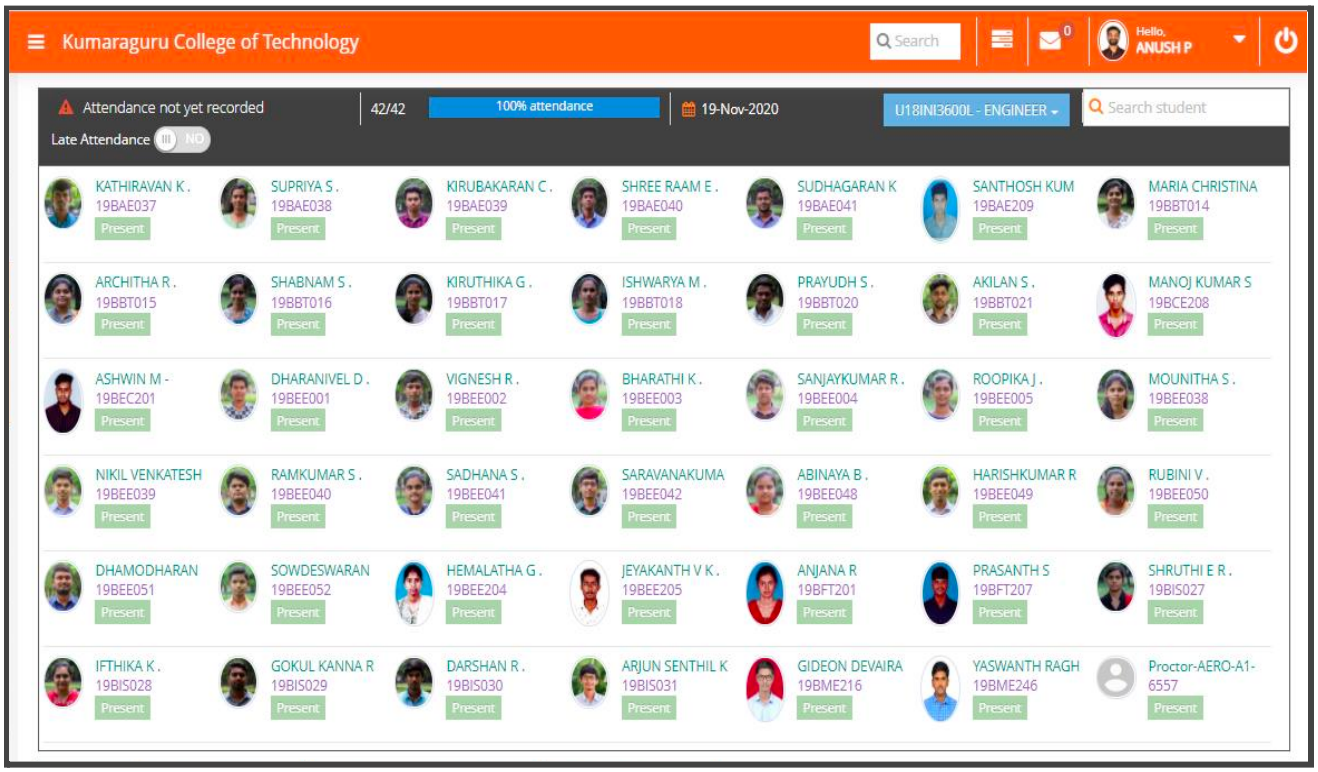


The LMS is the Open edX tool that learners use to access course content, including videos, textbooks, and problems, and to check their progress in the course. The LMS is used directly through a browser. There is no need for any additional software. Innovation Practicum utilizes AWS for its cloud offerings, and Bitnami's distribution runs all cloud infrastructures for the security aspects.

MS Teams: Microsoft Teams is a digital hub that brings conversations, content, assignments, and apps together in one place, letting educators/mentors create a vibrant learning environment for the student community. Within Teams, mentors can quickly converse with students by forming chats or groups, share files or documents necessary for the learning curve and assign polls, conduct, and distribute graded assignments. Separate cohorts were formed under each cycle, with the respective educators/mentors and the students. Public channels were created to carry out the discussion related to the specific module. All the technical and non-technical queries, reading materials, and important communications were made in these public channels.
A private channel was created for every educator/mentor and the respective students from the interdisciplinary departments were added. The mentor used this platform to communicate with the students and also to schedule meetings If necessary for the discussion



My Camu: My Camu is a school-home collaboration portal. It is used to map and track the attendance of the students. The interdisciplinary students were mapped with an innovation mentor and the attendance of the students was administered in this platform. For the respective timetable, a meeting will be scheduled between the educators and the students, automatically in the MS Teams. Students need to login via the My Camu portal for the mentoring hour and the attendance will be marked present to the respective.



Program Implementation

The stages of implementation range from learning materials for self-consuming to the execution of learning activities. The session plan is suggested for the program implementation. The mentors have all the liberty to modify and execute activities during the mentor hours depending on the team dynamics. All assignments have to be worked in teams and the submission is individual for the student.

Program Schedule: The engineering Sprint in the innovation practicum is designed to enable flipped classroom learning methodology. A flipped classroom is a type of blended learning, which aims to increase student engagement and learning by introducing the learning content at home and work on live problem-solving during class time. The Engineering Sprint is enabled for the students to watch the videos prior to the Mentor sessions and the interaction time is used for understanding and problem-solving.

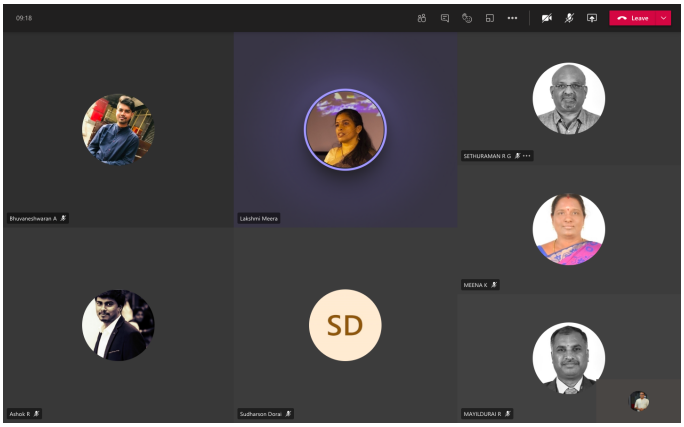
Mentor-Mentee Mapping: Under each cycle, separate cohorts were formed for each mentor-mentee team in order to have a seamless execution of the program since the volume of participants was large. There were 2 Cohorts (Cohort 1, Cohort 2) under each cycle. With each cohort, transdisciplinary teams were made in order to attain the defined outcomes.

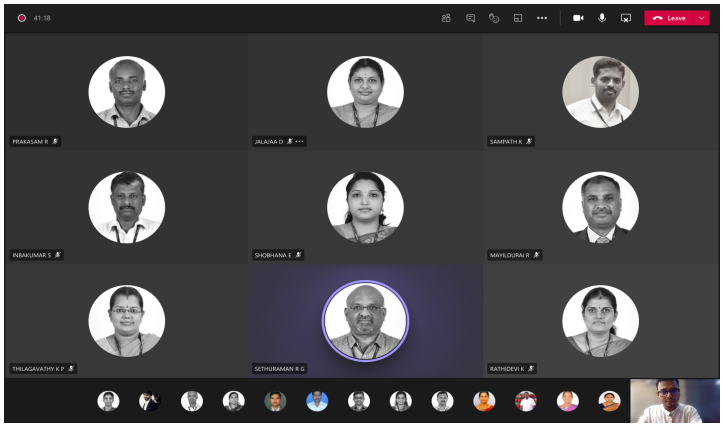
The Mentor-Mentee mapping was carried out to form teams of transdisciplinary teams. The students of various disciplines were formed together as a team and will be led by the Mentor for problem-solving. These teams involve inappropriately utilizing knowledge, skills, and best practice from multiple disciplines to redefine, re-scope, and reframe the challenges involved and to reach solutions based on an improved collective understanding. The results showed that these teams lead to a better understanding of the collaborative process, and how different professions complement has a positive effect on problem-solving with a sense of achievement. There were a total of **210 transdisciplinary teams with 35 mentors.**

Mentor Name	Mentor Mail ID	Team name	Team Member 1				Team Member2			
			Roll No	Name	KCT Mail ID	Dep	Roll No	Name	KCT Mail ID	Dep
Ms. S. Sivasakthi	<sivasakthi.s.sci@kct.ac.in>,	C1_Team 1	5857	SELVAKUMAR P	selvakumar.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5860	PUJA SHRI S K	pujashri.20cs@kct.ac.in	B.E-COMPUTER SCIENCE AND
		C1_Team 2	5863	SUHESHRITHIK M	suheshrithik.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5868	SUJITH R	sujith.20cs@kct.ac.in	B.E-COMPUTER SCIENCE AND
		C1_Team 3	5918	NISHAANTH S P	nishaanth.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5869	HARIPRASAD N M	hariprasad.20cs@kct.ac.	B.E-COMPUTER SCIENCE AND
		C1_Team 4	5919	ASWIN RAMESH	aswinramesh.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5879	ASWATH GANESH GUPTHA	aswathganeshguptha.20	B.E-COMPUTER SCIENCE AND
		C1_Team 5	5928	MOHAMED GHOUSE N	mohamedghouse.20ce@kct.a	B.E-CIVIL ENGINEERING	5880	KHAVYA S	khavya.20cs@kct.ac.in	B.E-COMPUTER SCIENCE AND
		C1_Team 6	5929	PRAGATHEESWAR R S	pragatheeswar.20ce@kct.ac.i	B.E-CIVIL ENGINEERING	5884	SAMYUKTHA RAJESH	samyuktharajesh.20cs@	B.E-COMPUTER SCIENCE AND
Ms. R.R. Mythili	<mythili.rr.sci@kct.ac.in>,	C1_Team 7	5934	SUMANTH ADHITAYA V S	sumanthadhitaya.20ce@kct.a	B.E-CIVIL ENGINEERING	5895	VIBIN T	vibin.20ec@kct.ac.in	B.E-COMPUTER SCIENCE AND
		C1_Team 8	5935	NAGHUL RAAJA M S	naghulraaja.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5912	JOSHUA A	joshua.20cs@kct.ac.in	B.E-COMPUTER SCIENCE AND
		C1_Team 9	5937	ENISH M	enish.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5922	DARSHAN R	darshan.20cs@kct.ac.in	B.E-COMPUTER SCIENCE AND
		C1_Team 10	5940	SRI HARI S	srihari.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5926	ALLWIN KENNETH P	allwinkenneth .20cs@kct	B.E-COMPUTER SCIENCE AND
		C1_Team 11	6128	SIVARAM KUMAR S	sivaramkumar.20ce@kct.ac.ir	B.E-CIVIL ENGINEERING	5927	NARENDRASUBRAMANIAM S	narendrasubramaniam.2	B.E-COMPUTER SCIENCE AND
		C1_Team 12	6137	SHANMUGA RAJA M	shanmugaraja.20ce@kct.ac.ir	B.E-CIVIL ENGINEERING	5941	SRI VISNU GANESH R	srivisnuganesh.20cs@kct	B.E-COMPUTER SCIENCE AND
Dr. K. Meena	<meena.k.sci@kct.ac.in>,	C1_Team 13	6201	PRIYANKA G	priyanka.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5944	PRASANNA BHARATHI M	prasannabharathi.20cs@	B.E-COMPUTER SCIENCE AND
		C1_Team 14	6241	RAGHUL M	raghul.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5945	HARINISHA B	harinisha.20cs@kct.ac.in	B.E-COMPUTER SCIENCE AND
		C1_Team 15	6285	SUNIL AUSTIN S	sunilaustin.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5960	SURYA PRAKASH S	suryaprakash.20cs@kct.a	B.E-COMPUTER SCIENCE AND
		C1_Team 16	6311	HARSHINI D R	harshini.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5963	AISHWARYA E	aishwarya.20cs@kct.ac.i	B.E-COMPUTER SCIENCE AND
		C1_Team 17	6328	KEERTHAN S	keerthan.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5966	DHARUNIKA NAMAGIRI B V	dharunikanamagiri.20cs	B.E-COMPUTER SCIENCE AND
		C1_Team 18	6333	NITHISHKUMAR S	nithishkumar.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5994	KARTHIKEYAN K	karthikeyan.20ec@kct.ac	B.E-COMPUTER SCIENCE AND
Dr. A. Ezhilarasi	<ezhilirasi.sci@kct.ac.in>,	C1_Team 19	6348	SWETHA A	swetha.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5998	NITYANAND VIJAYADITYA	nityanandvijayaditya.20c	B.E-COMPUTER SCIENCE AND
		C1_Team 20	6351	SANJAY A	sanjay.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	5999	DEVASENAN M	devasenan.20cs@kct.ac.	B.E-COMPUTER SCIENCE AND
		C1_Team 21	6366	JAYANTH K G	jayanth.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	6001	HARISHINI S	harishini.20cs@kct.ac.in	B.E-COMPUTER SCIENCE AND
		C1_Team 22	6395	ELAVARASAN S	elavarasan.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	6012	RAMANA GANESH B S	ramanaganesh.20cs@kct	B.E-COMPUTER SCIENCE AND
		C1_Team 23	6410	LOGA LAVANYA G	logalavanya.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	6014	BADHRINATHAN.S.B	badhrinathan.20cs@kct.	B.E-COMPUTER SCIENCE AND
		C1_Team 24	6415	SANJEEV S P	sanjeev.20ce@kct.ac.in	B.E-CIVIL ENGINEERING	6018	TARUN RAJGOPAL J	tarunrajgopal.20cs@kct.	B.E-COMPUTER SCIENCE AND

Mentor Hours: The mentor hours were scheduled using CAMU. The students will log-in via KITE-CAMU. The Engineering Sprint is designed and excited in the same fashion as a flipped classroom learning methodology. The students need to watch the videos prior to the Mentor sessions and the Mentor Hour is used for the interaction and clarifications. All assignments have been suggested to be worked in teams.

The MCQs were conducted during the mentoring hour by the respective mentors. Students use these mentor hours to share their thought process to validate their solution for the defined problem or solving assignments. Mentors will be guiding and monitoring the students when they brainstorm.





Module Launch

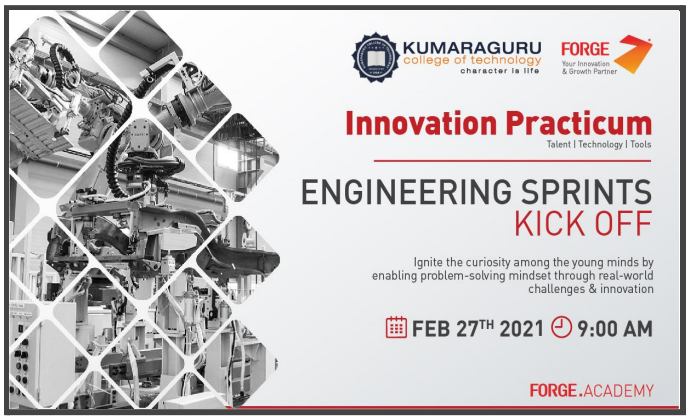
Kickoff: Engineering sprints as a program that has envisioned to transform the way we think about engineering. The program aims to enable curiosity in engineering and drives the students to understand the innovations in engineering and to identify and solve real-world problems. The Engineering Sprint was divided into two cohorts for the Kickoff.

The first batch of cohort - AI&DS, Civil, MECH, ECE, CSE, Textile departments had commenced from 19 - February - 2021. The second batch was scheduled for 27 - February - 2021 for the batches Automobile, Aeronautical, EEE, ISE, IT, MCE, EIE, FT and Biotechnology departments

In an effort to bring high-quality information and insights about the advanced technologies and techniques a series of expert talks has been organized for the students of Engineering sprint. These talks also provide students with alternative perspectives, opinions, and personal experiences that can learn from real work industrial experience.

Cohort I

Cohort II



Expert Talk 1:

MANU SASIDHARAN

Research Associate | University of Cambridge | UK

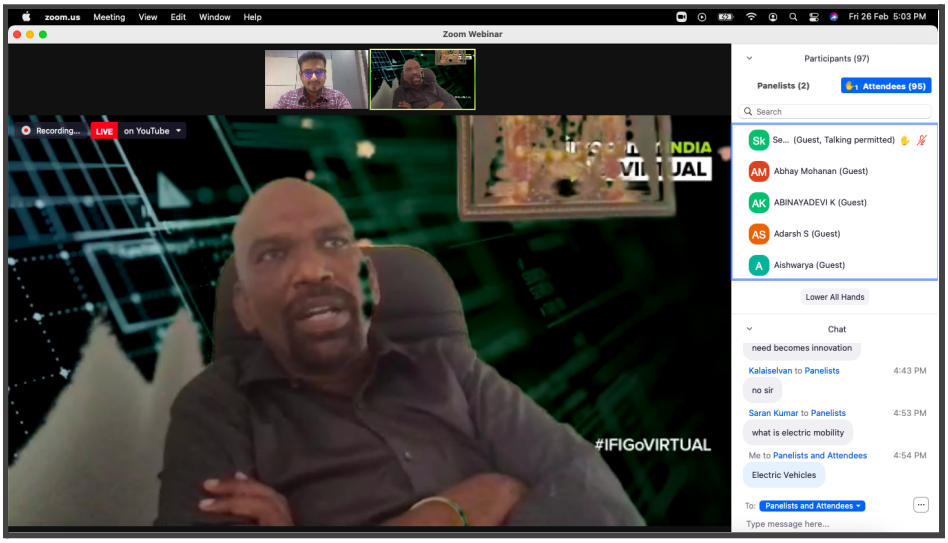
- **Short Profile of Expert Speaker:** Dr Manu Sasidharan - A proud alumni of KCT, who is currently working as a Post-Doctoral Research Associate at the University of Cambridge and is associated with the Centre for Smart Infrastructure and Construction, Institute for Manufacturing and Trust and Technology Initiative. He is also an Honorary Research Fellow at the University of Birmingham. He has addressed the opportunities for emerging technologies in the infrastructure industry with the advent of smart cities across the globe.

Expert Talk 2:

MANIKANDAN P

Founder & President - Society for Smart Mobility | Director - Powertrain, Ola Electric Mobility Pvt. Ltd, India

- **Short Profile of Expert Speaker:** Mr Manikandan P - Thought leader and expert in Electric Mobility Technology and future mobility Solutions. A seasoned professional with more than 20 years of experience in the Automotive Industry and the last 12 years in E-Mobility components, Systems and Solutions Development. He has addressed the gathering with the opportunities and emerging technologies in the sector of e-Mobility.

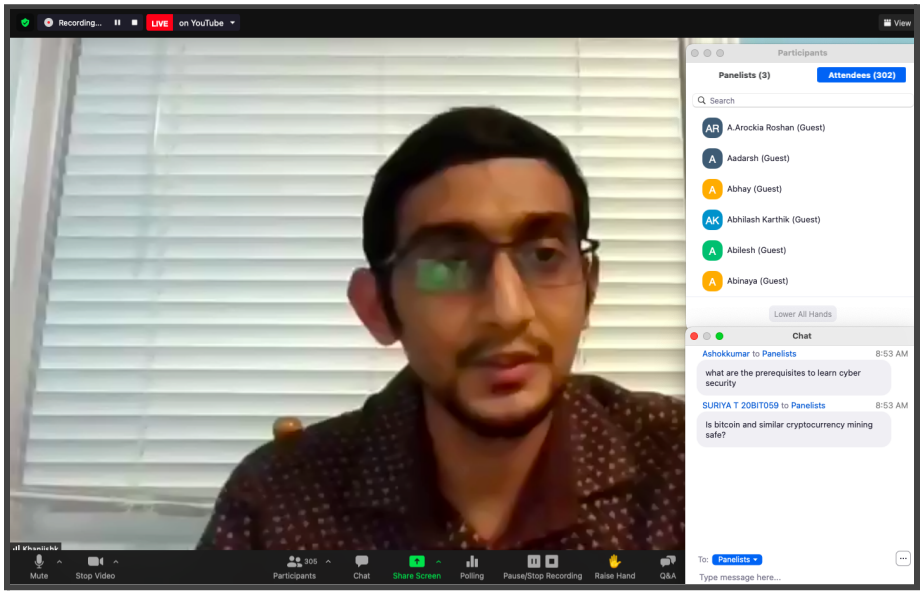


Expert Talk 3:

MANIKANDAN P

Security Analyst, Kubra Data Transfers | Canada

- **Short Profile of Expert Speaker:** Mr. Khaniishk Sukumar - He is a Senior Security Analyst, in Kubra Data Transfers, a product company located in Toronto, Canada. Completed his post-graduation in Sault College, GTA & his area of expertise includes firewall, Routers & switches for Symantec, Mcafee, Cisco Amp etc. He has addressed about the opportunities for emerging technologies in Cyber Security & Innovation

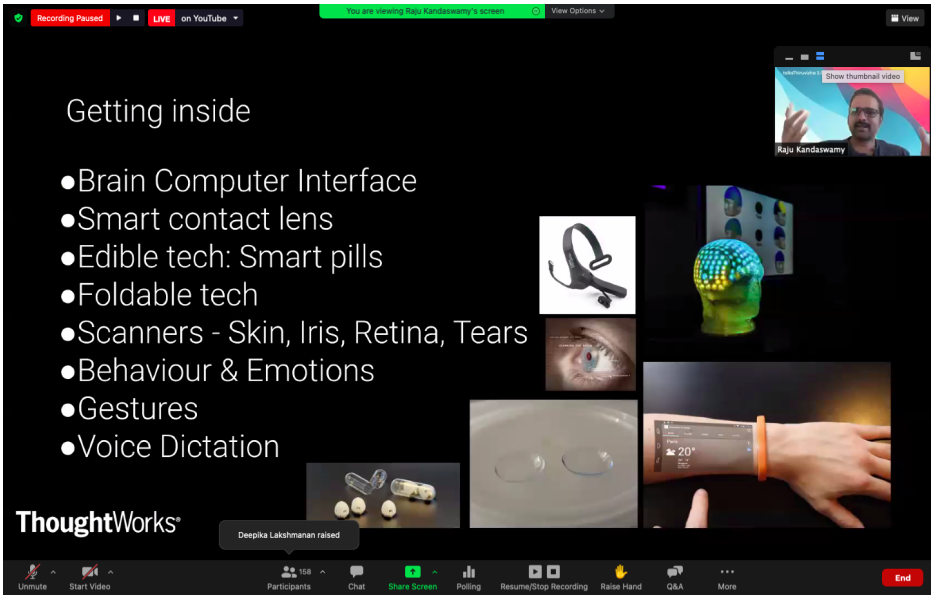


Expert Talk 4:

RAJU KANDASWAMY

Lead Consultant, ThoughtWorks

- **Short Profile of Expert Speaker:** Mr. Raju Kandaswamy - An innovator and tech enthusiast. He is passionate in the XR and industrial robotics arena. He has designed real-time high-transaction rate enterprise systems and telemetry solutions. He holds an MS in Software Systems from the Birla Institute of Technology and Science, Pilani. He He has addressed on Industrial Robotics with respect to the emerging technologies in industry 4.0



Assessments & Assignments

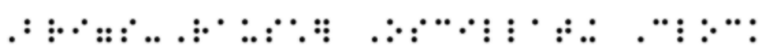
The assessments are an important criterion to understand the level of knowledge that the students possessed for the particular course. The assignments are designed in such a way that it provokes the student to spark up their knowledge. All the assignments were intended to assess their higher-order cognitive level. The assignments were recommended to work as a team since the students were formed from various disciplines. With this, the students will be sharing their thoughts on problem-solving and can come up with an out of the box solution.

There were totally **4** assignments, **4** MCQ, **1**3 Mentor Hour Quiz. All the assignments were conducted using MS Forms. Due date was scheduled for each assessment and was circulated to the students for them to work as a team and complete the same. Since the students were from different disciplines, it was necessary to bring the students to open up among the team and participate.

Sample Assignment in MS Forms:

Assignments - Engineering Sprint

Module 1 - Street Fighting Engineering
Consider the following braille language code and decode this to the English language. (20 Marks)



1. Find the name of the concept which has been related to the Braille code.
2. What is the base idea behind the concept that you have derived?

Module 2 - Programming Paradigm

1. Draw a flowchart for withdrawing money from an ATM. Make sure you check if a sufficient balance is available in the corresponding bank account. Also, the transaction has to be validated from the Bank's Database. (10 Marks)
2. Write an article about an algorithm or software you find mind-blowing and astonishing with reference to how it will influence our future and will lead to the betterment of civilization during this electronic era. (10 Marks)

Module 3 - Brains of Machines/Machine that make-up the world

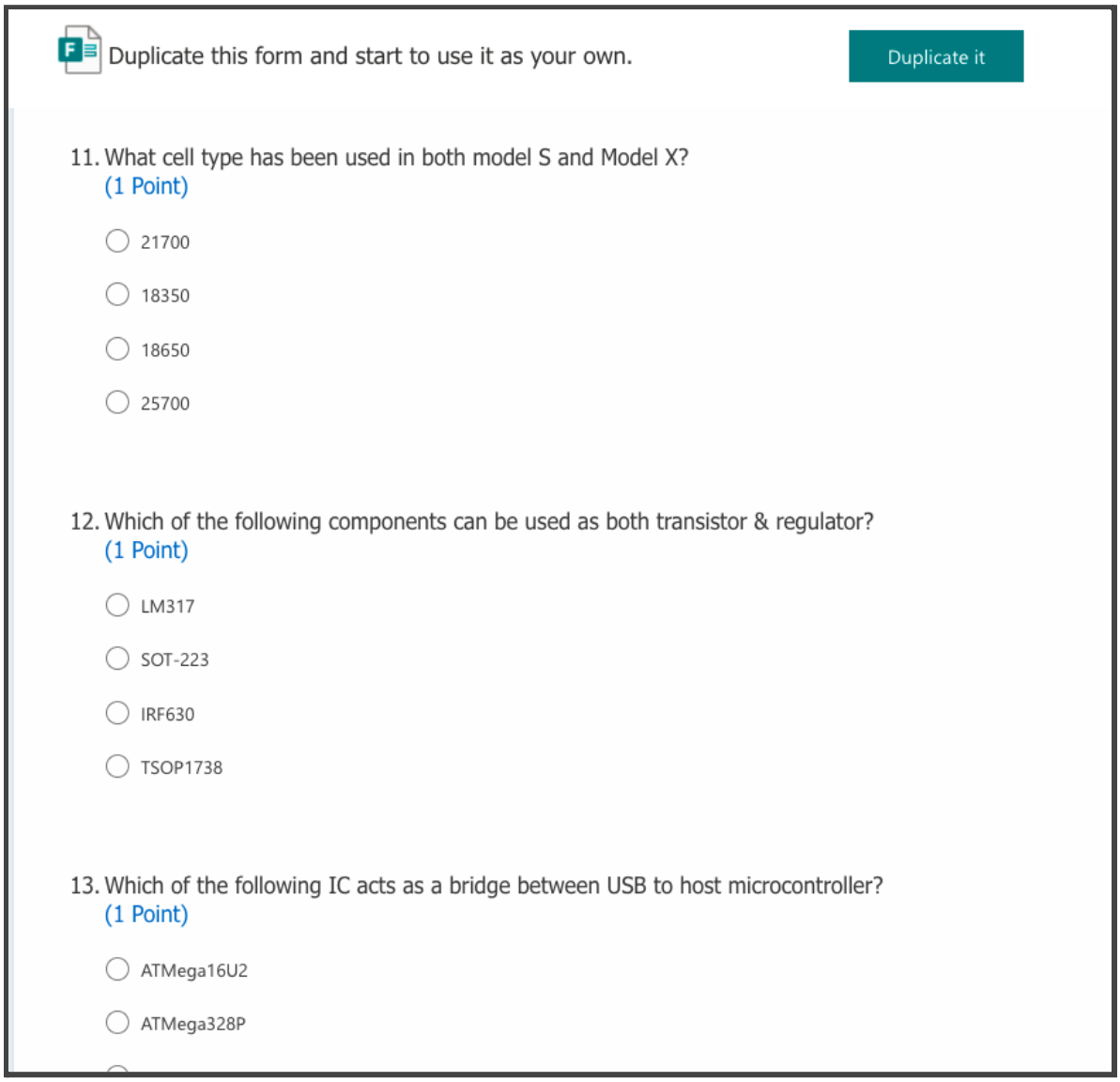
1. Select an innovation of your choice and consider it to be X. Then, apply the six strategies which come under Idea Hexagon to the selected innovation/idea (20 Marks)

Module 4 - Engineering the real world

1. A Two Stock System response.

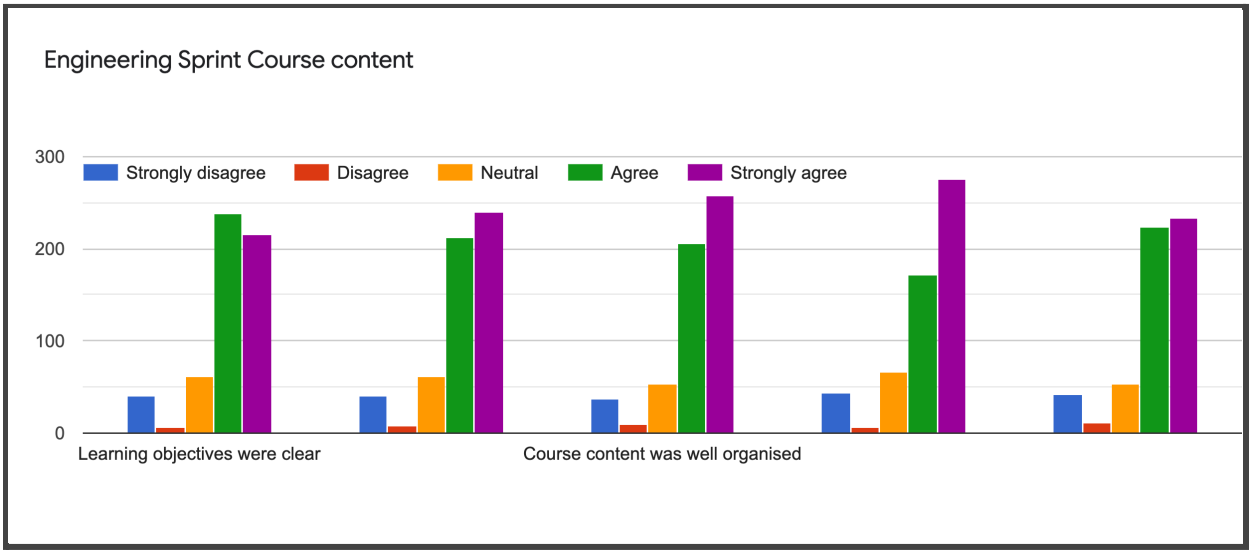
   Provided the systems stock and flow diagram look as below

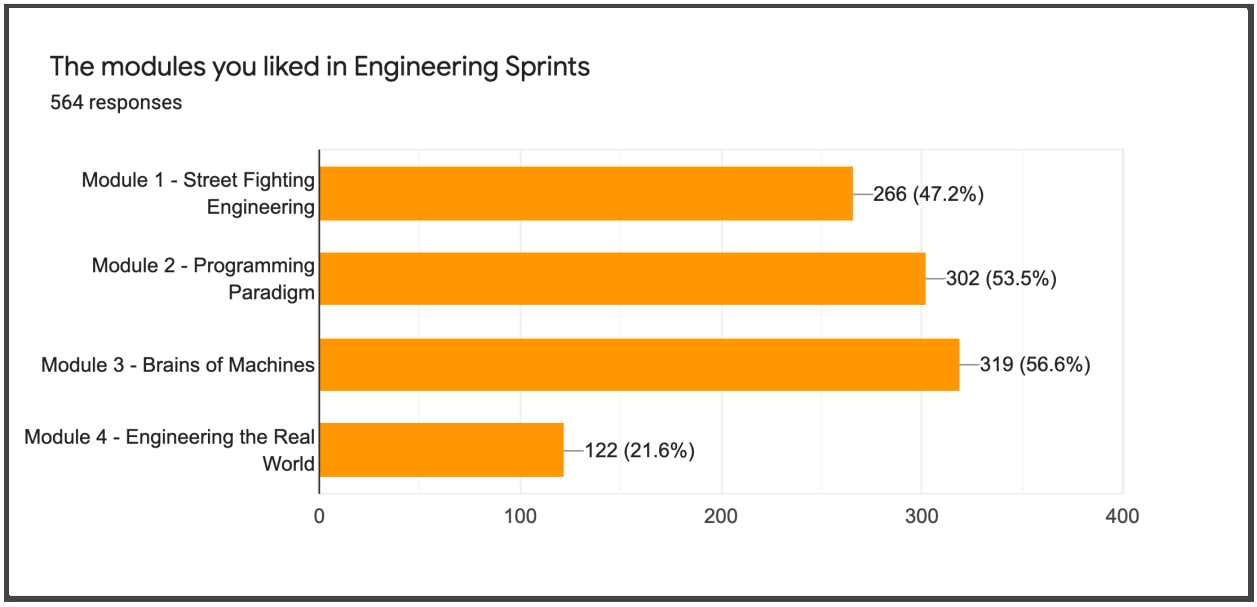
Sample MCQ in MS Forms:



Feedbacks & Suggestions

Feedback is valuable information that will be used to make important decisions. The feedback and suggestions were taken from the students and as well from the mentors to know more about the course curriculum, structure, assignments etc. The overall feedback was positive among students and mentors. The responses received from the students are shown below for the respective questionnaire:





What are the skills that you have acquired during Engineering sprint ?

448 responses

learnt how to make great ideas into successful innovations.

To solve problems easily

I previously had the thought that scientific innovation is far away from my intellect but now I beleive that proper research can help me in bringing out new innovations.

There are many ways to solve problemand our own creativity that matters all...

FACING PROBLEMS

Team work, information gathering, problem solving

How to solve the situation by programming

Problem solving and critical thinking

Inovation,creative problem solving ability

List three things that you have learned new, from Engineering sprint

429 responses

intro to SFE process, Dyson's Air purifier & vaccum cleaner and Arduino on a breadboard & Arduino BOOTLOADER on ATMEGA328 IC and idea hexagon.

Programming
Engineering on real world
Street fighting engineering

I learnt a lot about space research and the role of algorithms in it.
Also I gained the knowledge on various modern innovations happening around the world.

1.Creativity 2.Problem solving using algorithm 3.Electric car's (Tesla) working and constructing principle

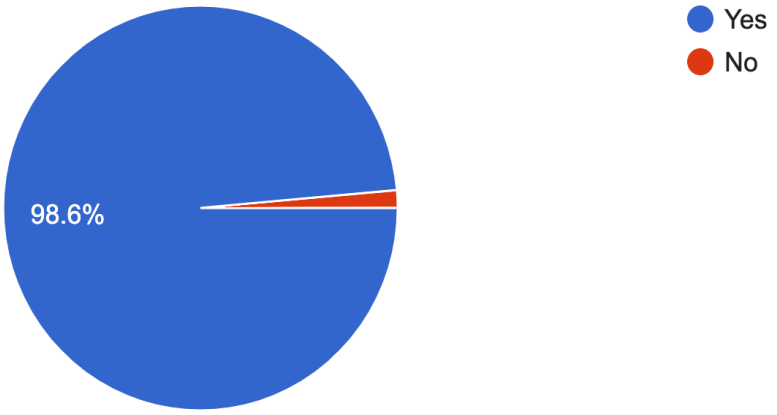
Teamwork, problem solving, basic electronics

Program, Smart think , Real life problem solving

About Tesla , basic electric components, computing skills

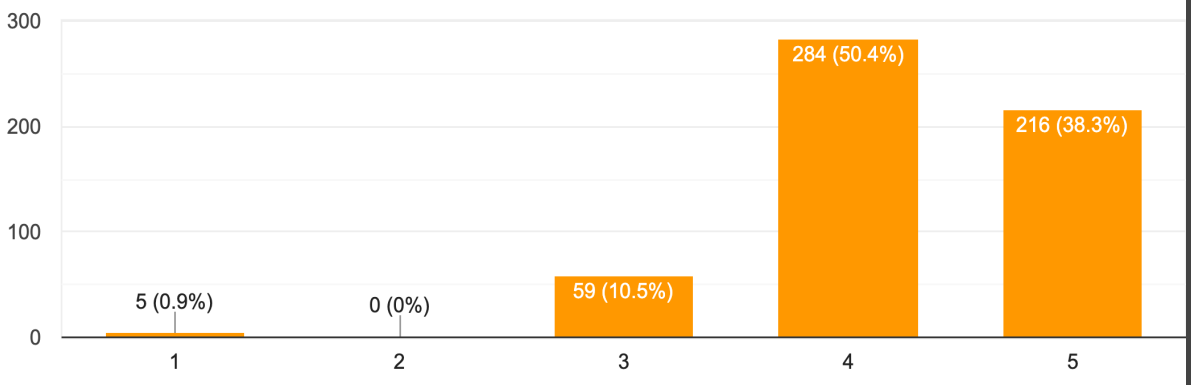
Did you get benefited from Expert Talks

564 responses



Rate the Overall Engineering Sprint Course

564 responses



Testimonials - Mentor

"Knowledge gained through self learning"

Dr.A. Ezhilarasi A, Assistant Professor,Topology, SRG

"It really drives the students to a new learning experience, sharing knowledge and team work"

Shobhana, Assistant professor, Physics (crystal growth), S&H

"Creative and Innovative skills"

Anbhuvizhi, Cryptography, S&H

"Thinking logically and innovatively"

Vijetha Iyer, Topology, S&H

Testimonials - Mentee

"Working with groups was amazing, i learned lot form my peers"

Murali Madhavan, AI & DS

"Creativity, innovation, team work"

Mega, ISE

"Idea Hexagon tools helps me to think new innovation"

Bala vignesh, Mech

"Activity-based learning enables me to understand the concepts much more better"

Aparna, ECE

Program Partner

Forge as a partner incubator empowers **Government, Industry,** and **Academia** to exploit strategic opportunities through Innovation powered by deep-technologies such as artificial intelligence, data science, robotics, power electronics, augmented reality/virtual reality, and IoT. By combining frontier Technology and future-ready Talent, we help our Partners drive operational excellence outcomes and achieve business growth goals, through collaboration and co-creation with startups at speed and scale via a managed innovation framework.
In recent years, though we see the Indian startup ecosystem thriving, the indigenous engineering talent adept at exploiting & harnessing futuristic technologies have predominantly been focused on building replicas of consumer-internet products of the modern Silicon Valley owing to the high rate of investment flow in the space. Forge intends to bring a change and shift the focus towards industrial deep-tech startups which hold the key to solving India's toughest challenges in areas like manufacturing, transportation, urban infrastructure, healthcare, agriculture, water management, and various other issues impeding the economic and social development of the nation.

Forge as a **catalyst** for this process of Entrepreneurship, helps innovators and founders acquire and develop the resources and capacity to transform their innovative ideas into high-growth enterprises. The pivotal role played by the skills and competencies of these protagonists in key functional areas covering technology, innovation, business strategy and development, financial planning, operations, etc. can never be overestimated. And equally critical is the need for a structured and systematic approach to offering the necessary training, mentoring, and financing support to these visionaries.
Over the past few years, Forge has been recognised as the Partner Incubator for **iDEX by Min. of Defence**, nominated as the principal nodal centre for anchoring the **Smart India Hardware Hackathon by MHRD & AICTE**, approved by **AICTE to offer a unique 2-year MBA in Innovation, Entrepreneurship, and Venture Development**. As the Strategic Incubation Partner for Corporate Open Innovation programs, Forge has engaged with **Bosch for its Accelerator program**, managed the execution of the **Schneider Innovation** Grand Challenge, and is in the process of implementing a similar innovation challenge for **AstraZeneca**. Forge enables its Corporate

Partners to derive Enterprise Value and achieve Strategic outcomes in the areas of Operational Capabilities, Commercial Partnerships and rapid inorganic growth via Strategic Investments.
Forge is recognised as the Strategic Partner for Vedanta Spark, a global innovation challenge and corporate accelerator program launched by Vedanta Limited, the global energy and resources conglomerate. Through the program, Forge aims to facilitate the identification and exploitation of opportunities for digitization across the value chain through collaboration with Indian & Global startups via Innovation & Venture partnerships. Forge is in conversation with many other large Industry Partners for their Corporate Acceleration Programs leading to creation of strategic assets and organisational enrichment.

Recently, Forge has been recognised as one of the 4 partner incubators to execute **SASACT** (Scheme for Accelerating Startups Around Post COVID Technology Opportunities) launched by MeitY, Government of India to fund Industrial Digital Technology startups with products responding to the post-COVID era with a corpus of 2.5 Cr. Forge is also a recognised **PRAYAS** centre and certified partner for **TIDE 2.0**, an initiative by **MeitY Startup Hub**.

Most significantly, Forge has been nominated as the **Partner Incubator by SIPCOT, a Govt. of Tamil Nadu** undertaking under the aegis of the Industries Department, for the establishment of Industrial Innovation Centres in each of the SIPCOT Industrial SEZs. The initiative is aimed at unlocking the massive potential for socio-economic growth by combining TN's strengths in manufacturing excellence with technology leadership attained through catalyzing innovation, venture capital, and entrepreneurship among its highly talented youth. To begin with, two **SIPCOT Industrial Innovation Centres** (SIICs) shall be set up in the top manufacturing clusters in Tamil Nadu - Chennai and Hosur, and these Deep-Tech Incubators are expected to be fully operational by January 2021.
Since its inception, Forge has played a dominant role in incubating startups and prototyping innovations totalling to 134 in number currently at different stages of innovation, acceleration, and investment. Through our unique Student **Innovation Fellowship program** alone, 200+ Innovation Engineers have graduated, creating 50+ deployment-ready industrial product innovations, which are validated, tested, and co-created with sponsor MSME and Corporate industrial companies. Over Rs.1.5 Crores in the form of rewards, grants, and revenues have been won, further validating the enormously untapped capacity for innovation within students. Forge as the Partner Incubator is on a mission to build a **national-scale ecosystem** bringing together Government, Industry, and Academia to foster industrial open innovation.

Annexures

- Mentor List
- Assignment Questions
- Assignment Key
- Quiz/MCQ
- Reading Materials
- Peer Evaluation
- Feedback and Suggestion Questionnaire
- Mentor Assessment Sheet
- Sprint Analysis

Mentor List

Mentor List for Engineering Sprint - Cycle 1 & 2

#	Name of Faculty	Department	Mail ID
Cohort 1			
1	S. Sivasakthi	SCI	sivasakthi.s.sci@kct.ac.in
2	R.R. Mythili	SCI	mythili.rr.sci@kct.ac.in
3	K. Meena	SCI	meena.k.sci@kct.ac.in
4	A. Ezhilarasi	SCI	ezhilirasi.sci@kct.ac.in
5	R. Krishna Moorthy	SCI	krishnamoorthy.r.sci@kct.ac.in
6	J. Rajasingh	SCI	rajasingh.j.sci@kct.ac.in
7	D. Arivuoli	SCI	arivuoli.d.sci@kct.ac.in
8	S. Meena Priyadarshini	SCI	meenapriyadarshini.s.sci@kct.ac.in
9	R. Balamurugan	SCI	balamurugan.r.sci@kct.ac.in
10	R.G. Sethuraman	SCI	sethuraman.rg.sci@kct.ac.in
11	S. Inbakumar	SCI	inbakumar.s.sci@kct.ac.in
12	K. Sugandhi	SCI	sugandhi.k.sci@kct.ac.in
13	R. Mayildurai	SCI	mayildurai.r.sci@kct.ac.in
14	K. Karthik	SCI	karthik.k.sci@kct.ac.in
15	D. Jalajaa	SCI	jalajaa.d.sci@kct.ac.in
16	K. Rathidevi	SCI	rathidevi.k.sci@kct.ac.in
Cohort 2			

17	R. Rajkumar	SCI	rajkumar.r.sci@kct.ac.in
18	K.P. Thilagavathy	SCI	thilagavathy.kp.sci@kct.ac.in
19	R. Anbhuvizhi	SCI	anbhuvizhi.r.sci@kct.ac.in
20	A. Shanmughavadivu	SCI	shanmughavadivu.a.sci@kct.ac.in
21	J. Dhivya	SCI	dhivya.j.sci@kct.ac.in
22	S.R. Saratha	SCI	saratha.sr.sci@kct.ac.in
23	S. Aruna Devi	SCI	arunadevi.s.sci@kct.ac.in
24	Vijeta Iyer	SCI	vijetaiyer.sci@kct.ac.in
25	Princyflora	SCI	princyflora.m.sci@kct.ac.in
26	M. Selvambikai	SCI	selvambikai.m.sci@kct.ac.in
27	S.Nithya	SCI	nithya.s.sci@kct.ac.in
28	E.Shobhana	SCI	shobhana.r.sci@kct.ac.in
29	R. Prakasam	SCI	prakasam.r.sci@kct.ac.in
30	K.Prakasam	SCI	kannan.r.sci@kct.ac.in
31	K. Kalapriya	SCI	kalapriya.k.sci@kct.ac.in
32	K. Sampath	SCI	sampath.k.sci@kct.ac.in
33	S. Jyothi	SCI	jyothi.sci@kct.ac.in
34	R. Ashokkumar	SCI	ashokkumar.r.sci@kct.ac.in

Assignment Questions

Module 1 - Street Fighting Engineering

Consider the following braille language code and decode this to the English language. (20 Marks)

1. Find the name of the concept which has been related to the Braille code.
2. What is the base idea behind the concept that you have derived?

Module 2 - Programming Paradigm

1. Draw a flowchart for withdrawing money from an ATM. Make sure you check if a sufficient balance is available in the corresponding bank account. Also, the transaction has to be validated from the Bank's Database. (10 Marks)

2. Write an article about an algorithm or software you find mind-blowing and astonishing with reference to how it will influence our future and will lead to the betterment of civilization during this electronic era. (10 Marks)

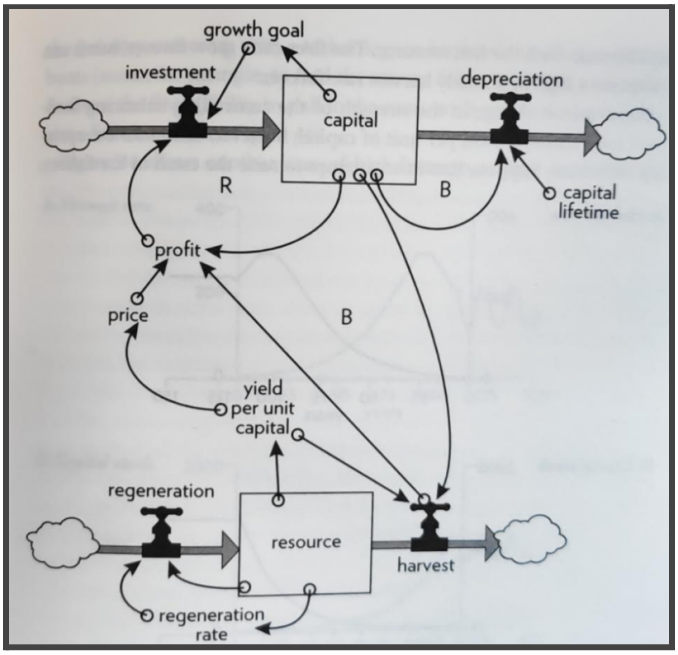
Module 3 - Brains of Machines/Machine that make-up the world

1. Select an innovation of your choice and consider it to be X. Then, apply the six strategies which come under Idea Hexagon to the selected innovation/idea (20 Marks)

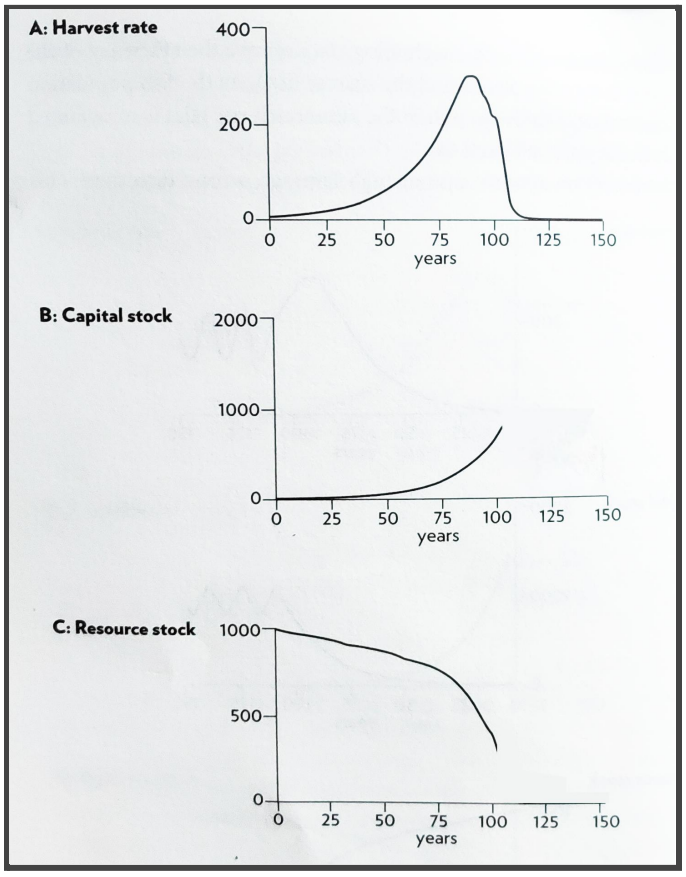
Module 4 - Engineering the real world

1. A Two Stock System response.

   Provided the systems stock and flow diagram look as below



Assuming harvest to change as shown in the graph below can you extrapolate the outcomes of the other two variables for years (125 and 150) (20 Marks)



Assignment Questions

Module 1 - Street Fighting Engineering

Question:

1. Consider the following braille language code and decode this to the English language.

A. Find the name of the concept which has been related to the Braille code.
B. What is the base idea behind the concept that you have derived? (20 Marks)

Answer key street fighting engineering

1. Briggs-Rauscher Oscillating Clock

Briggs-Rauscher reaction is one of the very few oscillating chemical reactions. The reaction produces visually stunning effects by changing the colour of the solution. To initiate the reaction, three colourless solutions are mixed together. The resulting solution will cycle while changing colour from clear to amber repeatedly for 3-5 minutes and ends up as dark blue. The three solutions required for this observation are diluted mixture of Sulfuric Acid (H2SO4) and Potassium Iodate (KIO3), a diluted mixture of Malonic Acid (HOOOCCH2COOH), Manganese Sulfate Monohydrate (MnSO4. H2O) and vitex starch and lastly, diluted Hydrogen Peroxide (H2O2).

Evaluation Metrics:

Metrics	Excellent	Average	Low
Identifying Name	Identified the name correctly - **10 Marks**	Identified the name partially - **5 Marks**	Identified the name with minimal correctness - **3 Marks**

Explanation of concept	Well detailed explanation - **10 Marks**	Listed most of the details in the explanation - **5 Marks**	Listed only a few explanations - **3 Marks**

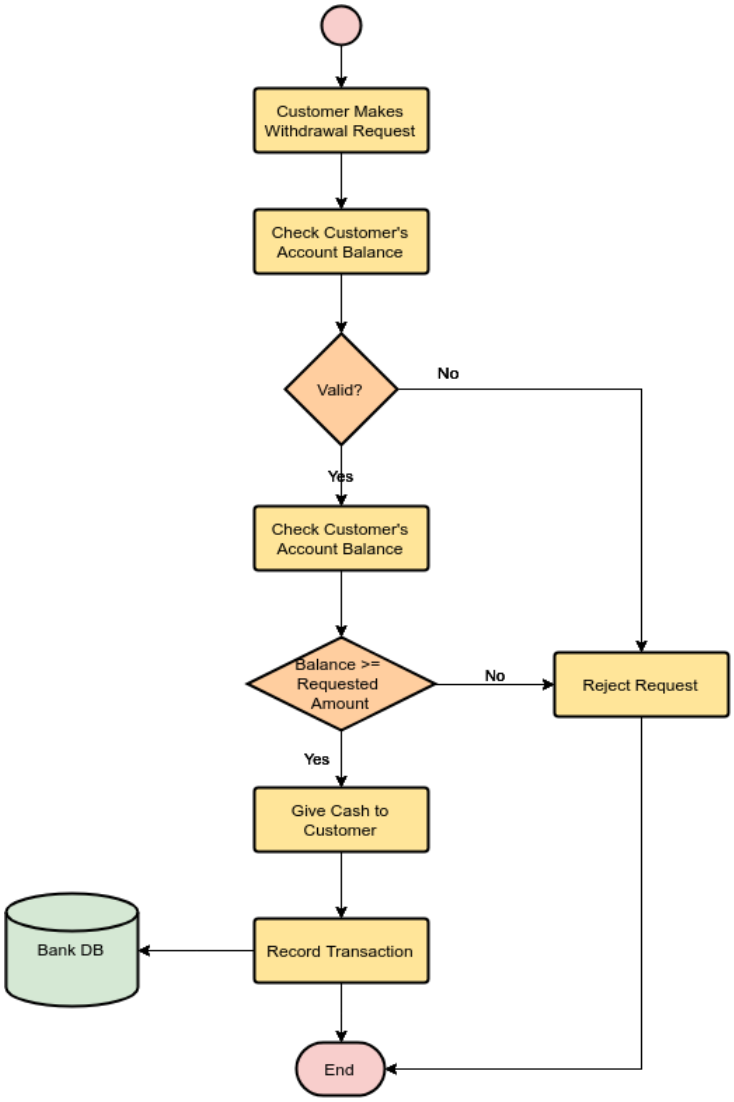
Module 2 - Programming Paradigm

Question:

1. Draw a flowchart for withdrawing money from an ATM. Make sure you check if a sufficient balance is available in the corresponding bank account. Also, the transaction has to be validated from the Bank's Database. (10 Marks)

Answer key Programming Paradigm

1. **Answer**



Evaluation Metrics:

Metrics	Excellent	Average	Low
Flowchart	Flowchart with all functions (Sufficient balance and validated transaction) - **10 Marks**	Flowchart with partially correct functions - **7 Marks**	Flowchart with at least one function - **5 Marks**

2. Write an article about an algorithm or software you find mind-blowing and astonishing with reference to how it will influence our future and will lead to the betterment of civilization during this electronic era. (10 Marks)

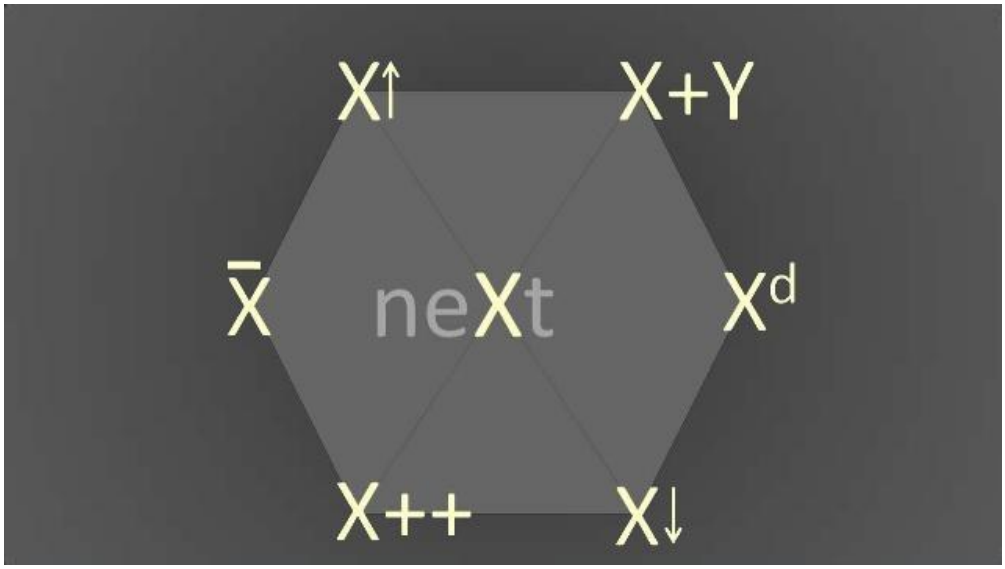
Answer Key:

Evaluation Metrics	**Maximum Marks: 10**
Explanation of algorithm or software understanding and definition	**5**
Its influence on our future	**3**
General thought process w.r.t. the problem and unique approach	**2**

Module 3 - Brains of Machines

Question:

1. Select an innovation of your choice and consider it to be X. Then, apply the six strategies which come under Idea Hexagon to the selected innovation/idea (20 Marks)



Answer key Brains of Machines/Machine that make-up the world:

Strategy #1 (X→ X^d) (3 Marks)

The innovation X is undergoing a dimensional change when a new idea is incorporated. This idea will provide X a **new dimension** and it will be denoted by X^d.

For example, X is an innovation that has been included with a dimension ‘d’ we get a new innovation X^d which solves the problem on a larger scale with a very huge potential. Then, we can say that the innovator has applied the Strategy #1 of Idea Hexagon and the outcome has been achieved.

Strategy #2 (X+Y) (3 Marks)

For example , if X is an innovation from the technology domain and Y is an innovation from the business domain. If both these domains are incorporated and if the user is able to form a completely new innovation which is able to solve real world problems then we can clearly say that the Strategy #2 of the Idea Hexagon has been applied and we have achieved the outcome.

Strategy #3 (X↑) (3 Marks)

For example , we have a set of problems a,b,c. And, the solution to solve these sets of problems has to be devised. But , if the innovator is able to develop a common solution for all the problems mentioned above then we can say that the Strategy #3 of Idea Hexagon has been applied and the outcome has been achieved.

Strategy #4 (X↓) (3 Marks)

For example , let us consider that the set of problems a,b and c are solved by an innovation X. But , if the innovator is able to solve the same set of problems a,b and c with another innovation Y which is completely different from the idea that was the base of innovation X.
So , if one problem can have many solutions then we can clearly say that the Strategy #4 of Idea Hexagon has been applied and the outcome has been achieved.

Strategy #5 (X̂) (4Marks)

For example , let us say the innovation X was made to solve the problem of computing.
But , innovation X was really huge and it was not portable. This was a huge concern and this led the innovators to think in a different way and it led to the innovation of innovation Y which was small ,

portable and it was also performing the same computing which was being done by the large innovation X.
In conclusion , if the innovator is able to simplify the existing solution by thinking in a completely different direction to solve the same problem then we can clearly say that the Strategy #5 has been achieved and the outcome has been achieved.

Strategy #6 (X++) (4 Marks)

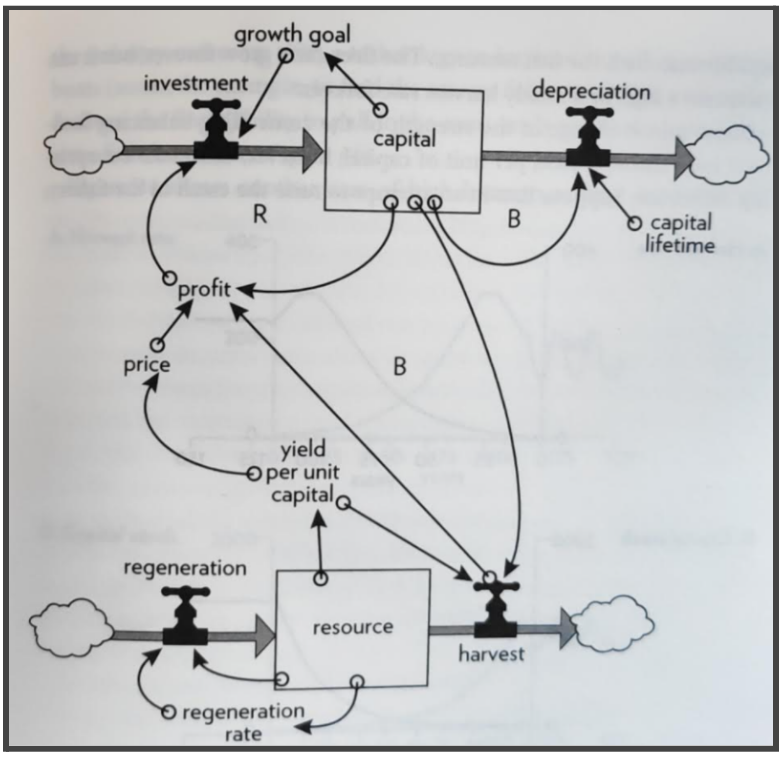
For example , let us say that innovation X is solving a critical problem but , the outreach of the solution is not as expected as it is supposed to be. Then , in order to improve the outreach of innovation X we are adding an adjective to the same innovation strategy. Then X becomes X++.
Let us consider a scenario where , 'Uber' launches a taxi service in a city. But , they are getting only a limited number of bookings every day this incurs a huge loss to the company. In order to overcome this 'Uber' incorporates a new marketing strategy where the taxi fare is reduced so which in turn increases the number of bookings. Here, the adjective which has been added is "Cheaper" and the outcome which has been achieved is 'Cheaper Uber'. This is the new innovation which was incorporated with the existing innovation and the outcome was achieved.

In conclusion , if the innovator is able to add an adjective to an existing innovation and if the outreach of the innovation is increased then , we can say that Strategy #6 has been applied and the outcome has been achieved.

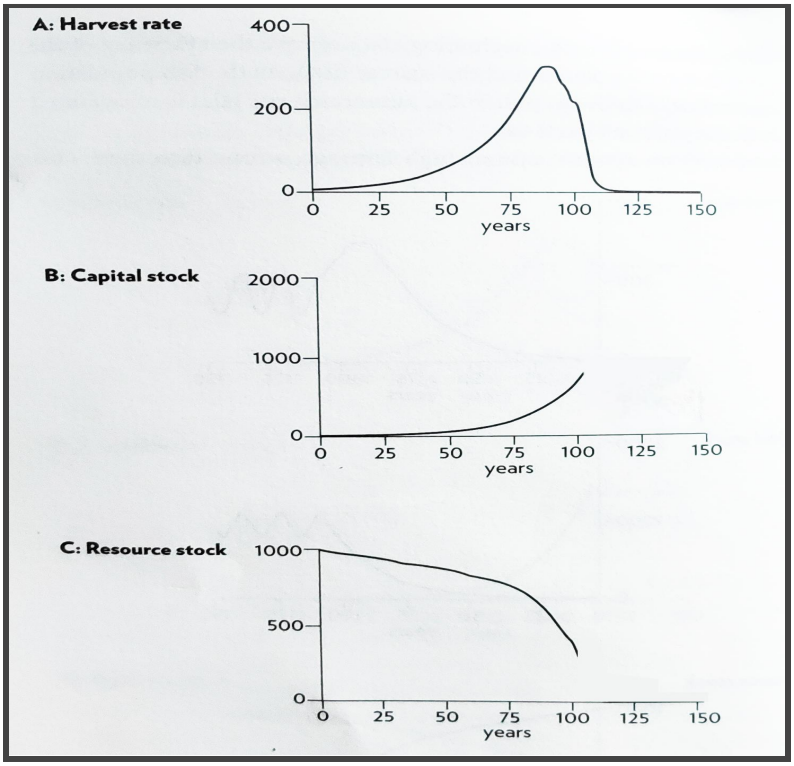
Module 4 - Engineering the Real World

1. A Two Stock System response.

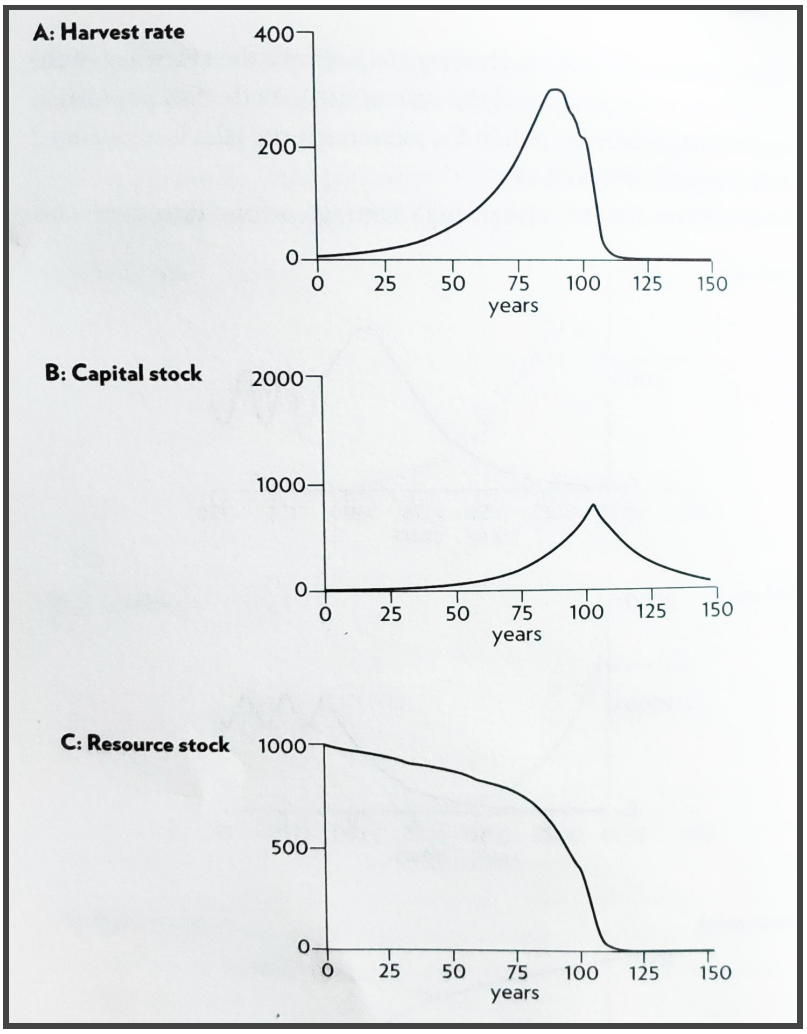
   Provided the systems stock and flow diagram look as below



Assuming harvest to change as shown in the graph below can you extrapolate the outcomes of the other two variables for years (125 and 150)



Answer Key :



Evaluation Metrics	Maximum Marks: 20
Graph generated for Harvest Rate	**7**
Graph generated for capital stock	**7**
Graph generated for Resource stock	**6**

Quiz / MCQs

Module1 - Street Fighting Engineering

1. Hydrolysis of sucrose gives

   (a) Glucose only

   (b) Glucose + fructose

   (c) Glucose and galactose

   (d) Maltose

   Answer: b

2. Keratin present in hair is an example of

   (a) Fibrous protein

   (b) Globular protein

   (c) Conjugated protein

   (d) Derived protein

   Answer: a

3. The Drug which is used to reduce anxiety and brings calmness is known as

   (a) Tranquilizer

(b) Diuretic

(c) Analgesic

(d) Antacids

Answer: a

4. If matrices A and B are inverse of each other then

(a) AB = BA

(b) AB = BA = I

(c) AB = BA = 0

(d) AB = 0, BA = I

Answer: b

5. If the system of equations x + ay = 0, az + y = 0 and ax + z = 0 has infinite solutions, then the value of a is

(a) –1

(b) 1

(c) 0

(d) No real values

Answer: a

6. When an algorithm is written in the form of a programming language, it becomes a _____

(a) Flowchart
(b) Program
(c) Pseudocode
(d) Syntax

Answer: b

7. Which one of the following is the most dangerous computer virus?

(a) Conficker
(b) I Love you
(c) Melissa
(d) Creeper

Answer: b

8. Magnetic disk or simply disk is an information storage device.

(a) City
(b) Organization
(c) Department
(d) Individual

Answer: d

9. This is a crucial attribute that is required of all problem solver

(a) Unbiased
(b) Prejudiced
(c) Waiting for skill
(d) Listening skill

Answer: a

10. In programming the value of a constant

(a) Remains the same once the variable is given a value
(b) Changes regularly in the program
(c) Does not changes during program execution
(d) Is only affected when new values are given to it

Answer: c

Module3 - Brains of Machines/Machines that Make-up the World

11. What are transdisciplinary systems?
    (a) Innovating in a single vertical
    (b) Innovating by adopting open innovation
    (c) Innovating in multiple vertical
    (d) Co-creation with other corporates

    Answer: c

12. What cell type has been used in both model S and model X? (taken)
    (a) 21700
    (b) 18350
    (c) 18650
    (d) 25700

    Answer: c

13. Idea Hexagon framework helps you to? (taken)

    (a) Helps to convert idea to business
    (b) Take innovation to next level
    (c) Finding right solutions
    (d) Helps to get a new venture

    Answer: b

14. Which of the following IC acts as a bridge between USB to host microcontroller? (taken)
    (a) ATMega16U2
    (b) ATMega328P
    (c) ATMega8515
    (d) ATMega32L

    Answer: a

15. What is the package size of ATMega328P? (taken)
    (a) DIP-16
    (b) DIP-20
    (c) DIP-28
    (d) DIP-32

    Answer: c

16. What is a reinforcing loop
    (a) affects the stock to get bigger and bigger over time
    (b) pull the amount of the stock towards a constant
    (c) Has a positive effect on the flow
    (d) Might have a positive or negative effect on the flow
    Answers: a
        a) 1,3
        b) 2,4
        c) 1,4
        d) 2,3

17. What is a balancing loop
    (a) affects the stock to get bigger and bigger over time
    (b) pull the amount of the stock towards a constant
    (c) Has a positive effect on the flow
    (d) Might have a positive or negative effect on the flow
    Answers: b
        a) 1,3
        b) 2,4
        c) 1,4
        d) 2,3

18. How can we overcome tragedy of the commons
    (a) enforce moral codes
    (b) Privatisation
    (c) Legislation
    (d) All the above
    Answer: c

19. Which action can overcome Gaming the rules
    (a) getting everyone to align in the same direction
    (b) by explaining the intention of the rule
    (c) redesigning the rules
    (d) All the above
    Answer: d

20. What can avoid Escalation system trap

(a) Not escalating
(b) Coming to an common agreement
(c) If one can bear it then to go along with it
(d) All the above

Answer: d

Quiz / MCQs

Module1 - Street Fighting Engineering

1. Street-Fighting Mathematics The Art of Educated Guessing and Opportunistic Problem Solving - https://library.oapen.org/viewer/web/viewer.html?file=/bitstream/handle/20.500.12657/26090/1003996.pdf?sequence=1&isAllowed=y
2. Mind Maps A powerful approach to not-taking - https://www.mindtools.com/pages/article/newISS_01.htm

Module2 - Programming Paradigm

1. How to think like a programmer - https://www.pdfdrive.com/think-like-a-programmer-an-introduction-to-creative-problem-solving-e156859116.html
2. Learn to code - https://zapier.com/blog/think-like-a-programmer/
3. What is 8 queens problem - https://code.energy/8-queens-problem/
4. Introduction to pseudocode - https://www.futurelearn.com/info/courses/block-to-text-based-programming/0/steps/39492

Module3 - Brains of Machines/Machine that make-up the world

1. Tesla Motors - Documentary 2020 - https://www.youtube.com/watch?v=rD9PGi8hHvY&t=123s&ab_channel=TradingCoachUK
2. Engineering Essentials - https://www.sparkfun.com/engineering_essentials
3. How I2C Communication Works and How To Use It with Arduino - https://www.youtube.com/watch?v=6IAkYpmA1DQ&list=PLpblv_36wc_Rf2RappJnkXClNAzmYSD7a&ab_channel=HowToMechatronics

Module4 - Engineering the Real World

1. Thinking in systems - **https://www.google.co.in/books/edition/Thinking_in_Systems/JSgOSP1qkIUC?hl=en&gbpv=1&printsec=frontcover**
2. Thinking in systems - **https://research.fit.edu/media/site-specific/researchfitedu/coast-climate-adaptation-library/climate-communications/psychology-amp-behavior/Meadows-2008.-Thinking-in-Systems.pdf**
3. Dancing with Systems Reference Webpage - http://donellameadows.org/archives/dancing-with-systems/

Peer Evaluation

Instructions:

* One Person must Evaluate another based on their contributions for the team activities
* The marking must be fair enough and appropriate to the respective parameters

1. Your Full Name
2. Enter your full Roll No
3. KCT Mail ID
4. Your Team Name (Ex: C1_Team 12)
5. Your Department
6. Select your Cohort
    A. Cohort 1
    B. Cohort 2
    C. Cohort 3
7. Name of the peer in your team for the evaluation
8. Peer's Roll No

Please rate the individual's contribution on the scale of 5 *(1 - least and 5 - high)*

a. Group member participated fully in all the group or team meetings
b. Group member involved in building solutions as a team
c. Group member treated others respectfully and shared the workload fairly
d. Group member offered detailed, constructive feedback when appropriate
e. Group member completed assigned tasks on time

9. Any remarks that you like to share?

Feedback and Suggestion Questionnaire

Section 1 of 3

Engineering Sprint | Feedback and Suggestions

Dear Students,

Please submit feedback regarding the Engineering Sprint Course you have just completed, including feedback on course structure and content.

Thank you.

Your Name *

Short answer text

Roll No *

Short answer text

Department *

1. Mech
2. ECE
3. CSE
4. Civil
5. TT
6. Aero
7. MCE
8. Auto
9. EEE
10. EIE
11. ISE
12. IT
13. Bio
14. FT
15. AI&DS

Cohort *

1. Cohort 1
2. Cohort 2

Mentor Name *

Short answer text

Responsiveness of the Mentor *

	Strongly disagr...	Disagree	Neutral	Agree	Strongly agree
All the assignm...	○	○	○	○	○
Mentor prompt...	○	○	○	○	○
Interaction with...	○	○	○	○	○

Responsiveness of the Mentor *

	Strongly disagr...	Disagree	Neutral	Agree	Strongly agree
All the assignm...	○	○	○	○	○
Mentor prompt...	○	○	○	○	○
Interaction with...	○	○	○	○	○

Engineering Sprint Course content *

	Strongly disagr...	Disagree	Neutral	Agree	Strongly agree
Learning object...	○	○	○	○	○
Course Content...	○	○	○	○	○
Course content ...	○	○	○	○	○
Course allowed...	○	○	○	○	○
Course content ...	○	○	○	○	○

The modules you liked in Engineering Sprints *

- [ ] Module 1 - Street Fighting Engineering
- [ ] Module 2 - Programming Paradigm
- [ ] Module 3 - Brains of Machines
- [ ] Module 4 - Engineering the Real World

What are the skills that you have acquired during Engineering sprint ?

Long answer text

List three things that you have learned new, from Engineering sprint

Long answer text

What was your favorite part or module of Engineering sprint and why?

Long answer text

Did you get benefited from Expert Talks *

- ( ) Yes
- ( ) No

For Example, If you have been asked to pay for this course, will you pay for the value, knowledge & the experience you have gained? *

- ( ) Yes
- ( ) No

Section 2 of 3

If YES,

Description (optional)

How much would you pay? *

NOTE: You will NOT be asked to pay. This is only for the Survey purpose

Short answer text

Section 3 of 3

Section title (optional)

Description (optional)

Your suggestions to improve this course?

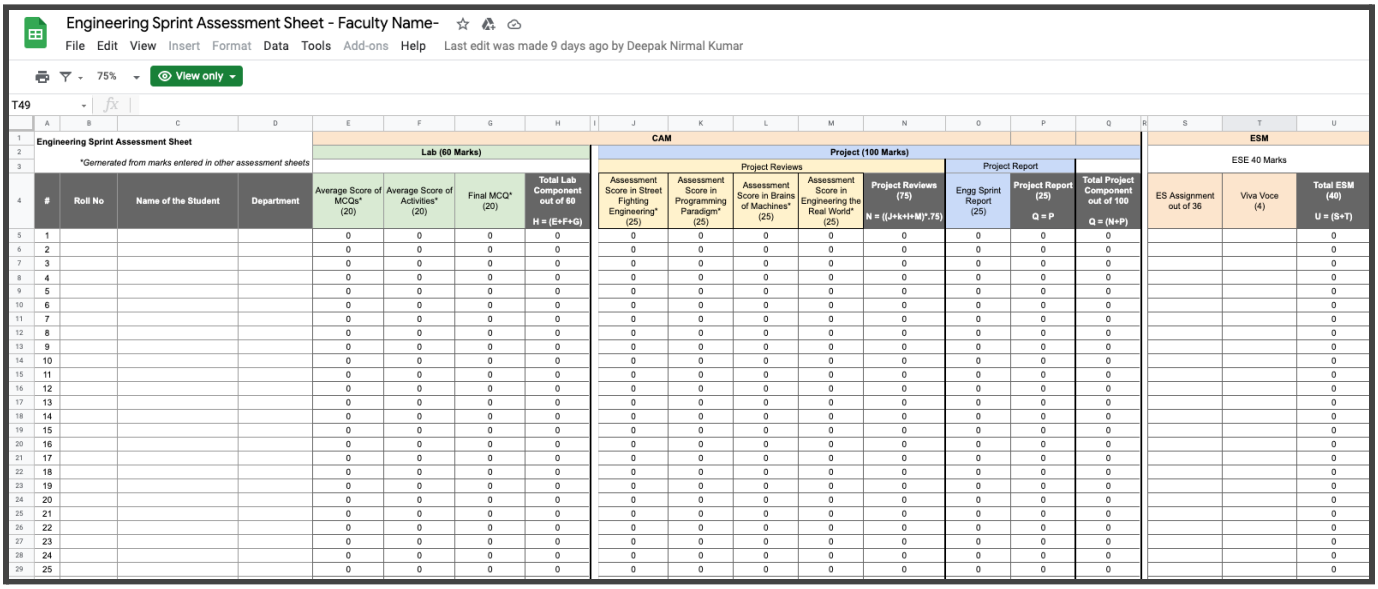
Long answer text

Rate the Overall Engineering Sprint Course *

	1	2	3	4	5	
Low	○	○	○	○	○	High

Mentor Assessment Sheet

Scoring Sheet For the Assignment:



Engineering Sprint Assessment Sheet - Faculty Name-

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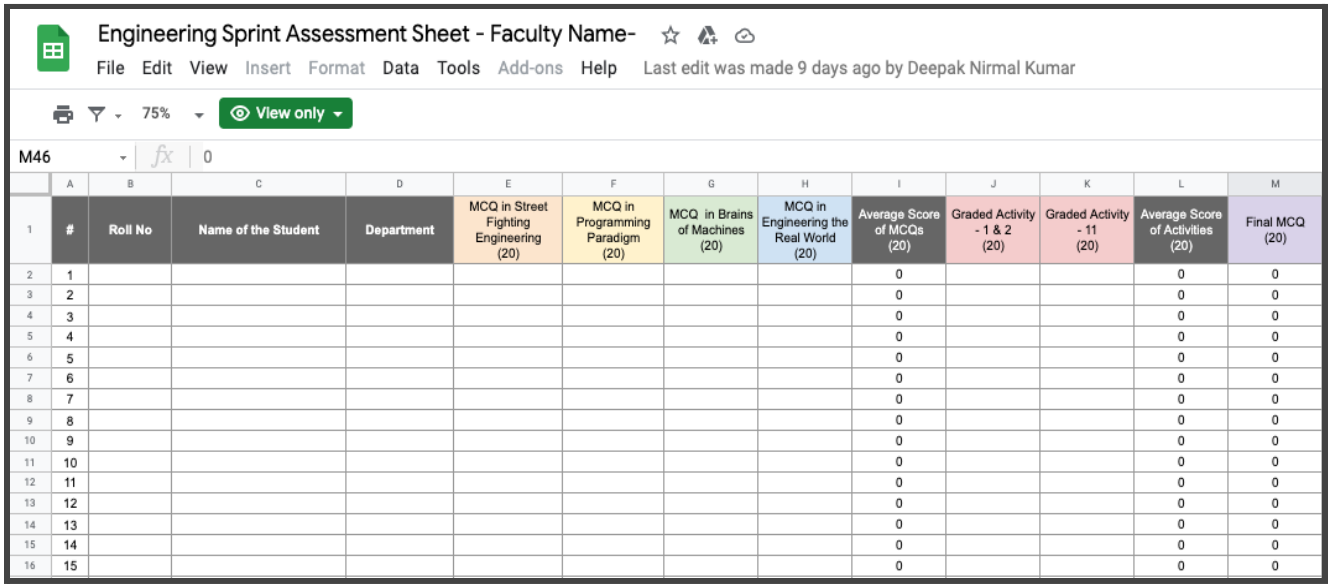
T49

					CAM										ESM		
Engineering Sprint Assessment Sheet					Lab (60 Marks)				Project (100 Marks)								
*Gemerated from marks entered in other assessment sheets									Project Reviews					Project Report			ESE 40 Marks
#	Roll No	Name of the Student	Department	Average Score of MCQs* (20)	Average Score of Activities* (20)	Final MCQ* (20)	Total Lab Component out of 60 H = (E+F+G)	Assessment Score in Street Fighting Engineering* (25)	Assessment Score in Programming Paradigm* (25)	Assessment Score in Brains of Machines* (25)	Assessment Score in Engineering the Real World* (25)	Project Reviews (75) N = ((J+k+l+M)*.75)	Engg Sprint Report (25)	Project Report (25) Q = P	Total Project Component out of 100 Q = (N+P)	ES Assignment out of 36	Viva Voce (4)	Total ESM (40) U = (S+T)
1				0	0	0	0	0	0	0	0	0	0	0	0			0
2				0	0	0	0	0	0	0	0	0	0	0	0			0
3				0	0	0	0	0	0	0	0	0	0	0	0			0
4				0	0	0	0	0	0	0	0	0	0	0	0			0
5				0	0	0	0	0	0	0	0	0	0	0	0			0
6				0	0	0	0	0	0	0	0	0	0	0	0			0
7				0	0	0	0	0	0	0	0	0	0	0	0			0
8				0	0	0	0	0	0	0	0	0	0	0	0			0
9				0	0	0	0	0	0	0	0	0	0	0	0			0
10				0	0	0	0	0	0	0	0	0	0	0	0			0
11				0	0	0	0	0	0	0	0	0	0	0	0			0
12				0	0	0	0	0	0	0	0	0	0	0	0			0
13				0	0	0	0	0	0	0	0	0	0	0	0			0
14				0	0	0	0	0	0	0	0	0	0	0	0			0
15				0	0	0	0	0	0	0	0	0	0	0	0			0
16				0	0	0	0	0	0	0	0	0	0	0	0			0
17				0	0	0	0	0	0	0	0	0	0	0	0			0
18				0	0	0	0	0	0	0	0	0	0	0	0			0
19				0	0	0	0	0	0	0	0	0	0	0	0			0
20				0	0	0	0	0	0	0	0	0	0	0	0			0
21				0	0	0	0	0	0	0	0	0	0	0	0			0
22				0	0	0	0	0	0	0	0	0	0	0	0			0
23				0	0	0	0	0	0	0	0	0	0	0	0			0
24				0	0	0	0	0	0	0	0	0	0	0	0			0
25				0	0	0	0	0	0	0	0	0	0	0	0			0

Scoring Sheet For the MCQ:



Engineering Sprint Assessment Sheet - Faculty Name-

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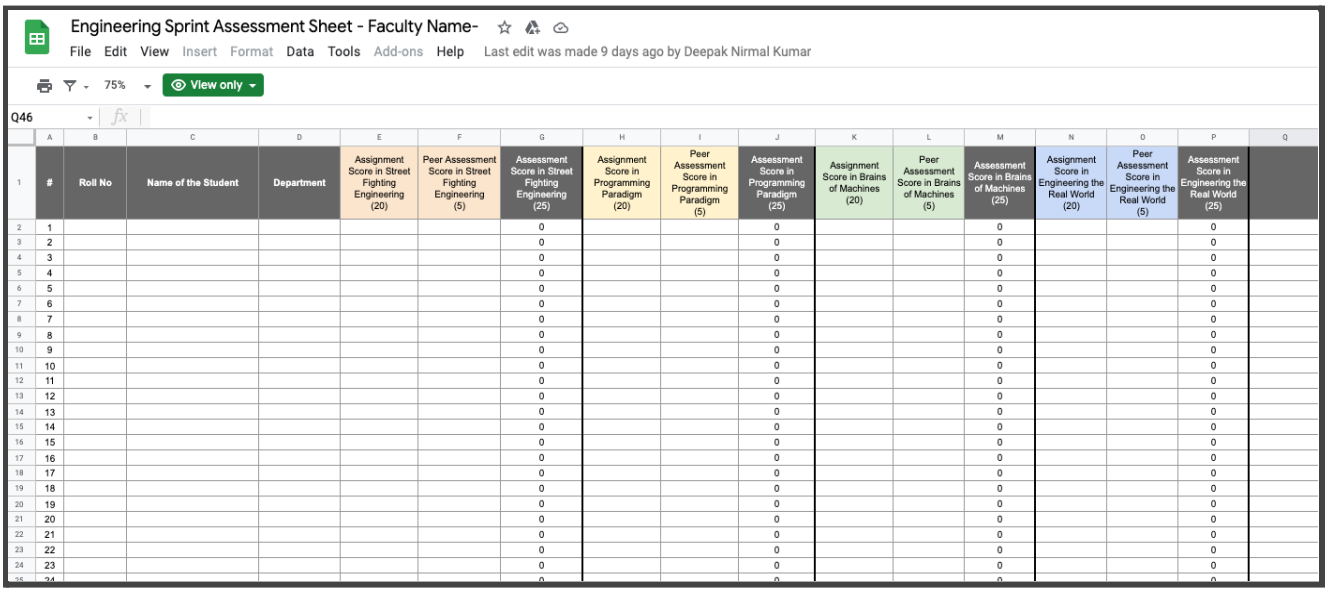
M46 0

#	Roll No	Name of the Student	Department	MCQ in Street Fighting Engineering (20)	MCQ in Programming Paradigm (20)	MCQ in Brains of Machines (20)	MCQ in Engineering the Real World (20)	Average Score of MCQs (20)	Graded Activity - 1 & 2 (20)	Graded Activity - 11 (20)	Average Score of Activities (20)	Final MCQ (20)
1								0			0	0
2								0			0	0
3								0			0	0
4								0			0	0
5								0			0	0
6								0			0	0
7								0			0	0
8								0			0	0
9								0			0	0
10								0			0	0
11								0			0	0
12								0			0	0
13								0			0	0
14								0			0	0
15								0			0	0

Assignment Assessment Sheet:



Engineering Sprint Assessment Sheet - Faculty Name-

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Q46

#	Roll No	Name of the Student	Department	Assignment Score in Street Fighting Engineering (20)	Peer Assessment Score in Street Fighting Engineering (5)	Assessment Score in Street Fighting Engineering (25)	Assignment Score in Programming Paradigm (20)	Peer Assessment Score in Programming Paradigm (5)	Assessment Score in Programming Paradigm (25)	Assignment Score in Brains of Machines (20)	Peer Assessment Score in Brains of Machines (5)	Assessment Score in Brains of Machines (25)	Assignment Score in Engineering the Real World (20)	Peer Assessment Score in Engineering the Real World (5)	Assessment Score in Engineering the Real World (25)
1						0			0			0			0
2						0			0			0			0
3						0			0			0			0
4						0			0			0			0
5						0			0			0			0
6						0			0			0			0
7						0			0			0			0
8						0			0			0			0
9						0			0			0			0
10						0			0			0			0
11						0			0			0			0
12						0			0			0			0
13						0			0			0			0
14						0			0			0			0
15						0			0			0			0
16						0			0			0			0
17						0			0			0			0
18						0			0			0			0
19						0			0			0			0
20						0			0			0			0
21						0			0			0			0
22						0			0			0			0
23						0			0			0			0
24						0			0			0			0

Sprint Analysis

Module 1 – Street Fight Engineering

Forge Syllabus	Type of Video	No. of Handouts/ Reading Materials	Quiz/ MCQs	Assignment Question	Exercise Template for Assignments
Street Fight Engineering					
1.1 What is street fight engineering?	Voice Over Video				
1.2 SFE Process vs Route learning	Voice Over Video				
1.3 SFE Process	Voice Over Video				
1.4 Route learning fragments the world	You Tube Video				
Working with Transno		2 Materials	1	1	1
2.1 Transno	Voice Over Video				
Sample Riddle					
3.1 Sample riddle	Voice Over Video				
3.2 Lactic acid example	Voice Over Video				
	Total :	**2**	**1**	**1**	**1**

Total No of Voice Over Videos:	**6**
Total No of Youtube Videos. :	**1**
Duration of Module I :	**3Hr 8 Min**

Module 2 – Programming Paradigm

Forge Syllabus	Type of Video	No. of Handouts/ Reading Materials	Quiz/ MCQs	Assignment Question	Exercise Template for Assignments
Problem solving with programming					
Intro - Problem solving with programming	Forge's Video	4 materials	5	1	1
Fox, goose and corn problem	Forge's Video				
Fox, groose from programmer's perspective	Forge's Video				
How computer memory works	You Tube Video				
How to create a flowchart in diagrams	You Tube Video				
How to think like a coder					
The prison breaker to world machine case studies	You Tube Video				
Programming in our day to day lives					
Programming in our day to day lives	Forge's Video				
Real time analogy for programming	Forge's Video				
Importance of programming	Forge's Video				
The art of code	You Tube Video				
How does binary code work	You Tube Video				
Algorithms - Space case study					

Algorithms that runs the modern world	Forge's Video				
Space war - Error & losses	Forge's Video				
ESA's Ariane 5 flight 501	You Tube Video				
NASA's mars climate orbiter	You Tube Video				
spaceX journey to the future	Forge's Video				
spaceX dragon and rocket systems	You Tube Video				
Algorithm that runs the modern world					
What is an Algorithm	You Tube Video				
Why algorithm are called algorithms	You Tube Video				
The need for algorithm	Forge's Video				
Turning machine (Alan Turing)	You Tube Video				
Google's page rank	You Tube Video				
Bot revolution	Forge's Video				
	Total :	**35**	**5**	**1**	**1**

Total No of Forge's Videos. :	**13**
Total No of Youtube Videos. :	**4**
Duration of Module II :	**3 Hr 30 Min**

Module 3 – Brains of Machines

Forge Syllabus	Type of Video	No. of Handouts/Reading Materials	Quiz/MCQs	Assignment Question	Exercise Template for Assignments
BOM					
BOM - Introduction	Voice Over Video				
Transportation 101	You Tube Video				
Electric cars & global warming emission	You Tube Video				
Tesla's 5 new ingenious projects	You Tube Video				
Transdisciplinary Systems to accelerate innovation					
Transdisciplinary Systems	Voice Over Video				
Brains of electric car	Voice Over Video				
Tesla batteries	Voice Over Video				
Tesla's model 3's motor	You Tube Video				
Inverter & drivetrain	Voice Over Video				
Tesla's self driving AI brains	Voice Over Video				
Working of Tesla's self driving - Autopilot	You Tube Video				
Conclusion	Voice Over Video				
Idea Hexagon					
Idea hexagon - Intro	Voice Over Video				
How to think like MIT Lab inventor	You Tube Video				
Basics of electronics					
Passive electronics components	Voice Over Video				
Capacitor	Voice Over Video				
Resistor	Voice Over Video				
		3	5	1	1

Diode	Voice Over Video				
How to use a breadboard	You Tube Video				
How to use a multimeter	You Tube Video				
Sensor & actuators					
What is Sensor?	You Tube Video				
What is an actuator?	You Tube Video				
Analyzing & understanding of electronic circuit					
Basic electronics	Voice Over Video				
The microcontroller	Voice Over Video				
Power & ATMega8U2	Voice Over Video				
schematic	Voice Over Video				
Digital & analog	Voice Over Video				
Communication protocol	Voice Over Video				
ICSP - In circuit serial programming	Voice Over Video				
Analyzing & understanding of electronic circuit					
How to build a custom hardware	Voice Over Video				
Arduino on a breadboard	You Tube Video				
Arduino bootloader on ATMEGA328 IC	You Tube Video				
	Total. :	**32**	**5**	**1**	**1**

Total No of FORGE's Videos. :	**20**
Total No of Youtube Videos. :	**12**
Duration of Module III :	**3 Hr 4 Min**

Module 4 – Engineering the real world

Forge Syllabus	Type of Video	No. of Handouts/Reading Materials	Quiz/MCQs	Assignment Question	Assignment Question Set
System Thinking					
ST - introduction	Voice Over Video				
Module walkthrough	Voice Over Video				
System thinking mindset	You Tube Video				
System Basics					
Real world problem - Stock & flow diagrams	Voice Over Video				
Single stock system response	Voice Over Video				
Two stock system response	Voice Over Video				
System traps and opportunities					
System trap & opportunities	Voice Over Video				
Tragedy of the commons	Voice Over Video				
Escalation	Voice Over Video	3	5	1	1

	Total:	**13**	**5**	**1**	**1**

Total No of FORGE Videos. :	**13**
Total No of Youtube Videos. :	**2**
Duration of Module IV :	**1Hr**

FORGE
Your Innovation &
Growth Partner

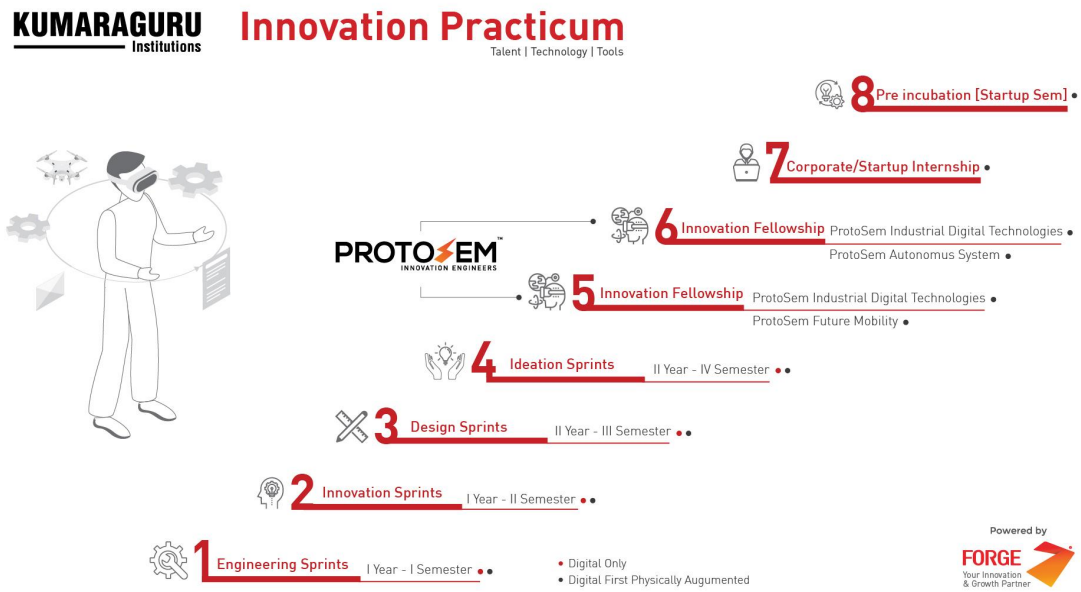
Forge Academy

Innovation Practicum | Innovation Sprints

Innovation Practicum

Innovation Practicum drives the institution's innovation outcomes through defined processes, methods and frameworks. This facilitates the strengthening of the innovation ecosystem in the Institution, by providing students & educators to build capabilities in innovation, technology and design. The **Innovation Centric Curriculum** delivered in a **Learner Centric Pedagogy** enables the transformation of students/educators into Innovation engineers/mentors capable of building innovative solutions for real-world problems. This also becomes a playbook for academic Institutions to foster a state of the art infrastructure conventionally termed as **Centres of Excellence** in partnership with Industry through Government funding schemes like Idea Labs**,** with the capacity of transforming an idea into a prototype. The platform essentially helps build a sustainable model to accelerate the number of product innovations, patents, grants, internship and differential employability outcomes enabled by innovation coaches, startup veterans, technology experts and industry professionals.

Innovation Practicum comprises a sequence of courses designed at the grassroots levels providing opportunities to identify and harness the real power of technology to solve industrial problems and challenges. It focuses on **Tools, Technology** & **Talent** delivered through Sprints & ProtoSem supported by technical resources, tools, equipment, etc. that are required across the entire spectrum of the innovation process.



Capacity Building | iMentor April 2021

iMentor is a program organized by FORGE for educators, researchers and tech mentors intending to become innovation Mentors. The program aims to impart Science and core skills of innovation and to help gain actionable awareness of the systematic process of developing ideas into products addressing real-world challenges.

Forge Academy has organized the iMentor program for Educators from April 23-27, 2021. The program concentrates on mentoring on Forge Innovation Tools for the next generation innovators with a culture of valuing people, along with their creativity and passions. The program is hosted in MS teams.

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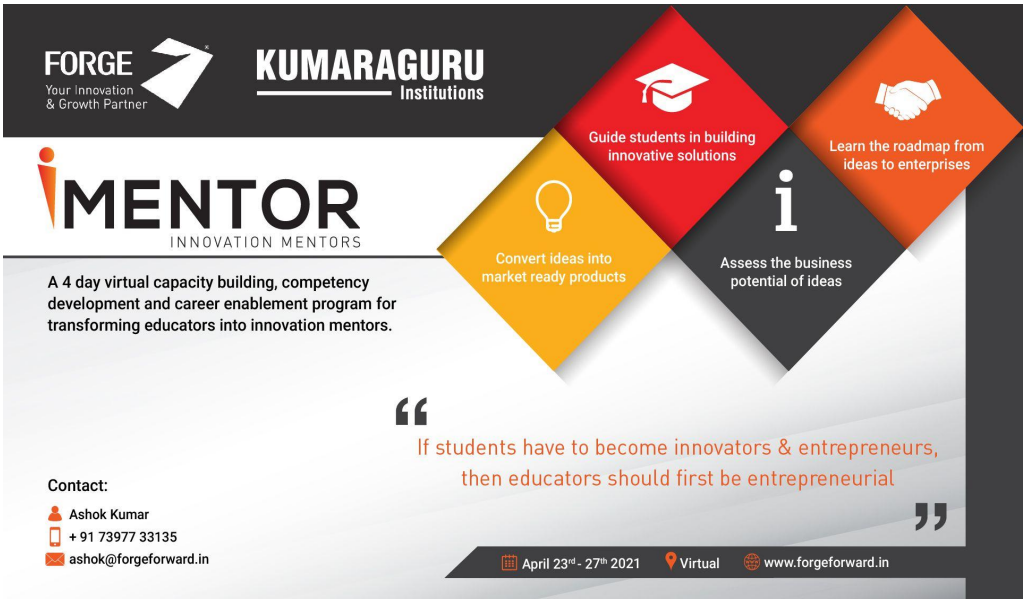

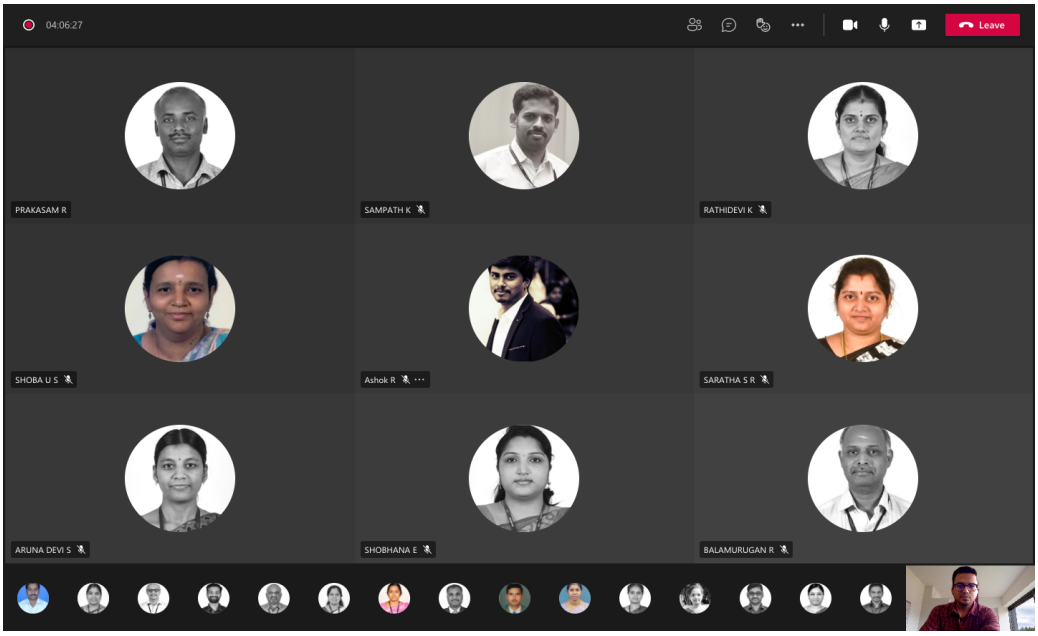

Innovation Sprint

Innovation Sprint, is the 7-day Sprint for 1079 first-year undergraduate engineering students from Kumaraguru College of Technology, Coimbatore as a 3 credit course.

Innovation Sprint - the second in the sequel of Innovation Practicum, focuses on seeding and activating innovation mindset among the young minds. Students shall learn the first principles of innovations through immersive & experiential learning facilitated by educators. Students are put through a time-crunched rigorous process of fundamentals of innovation, ideation, pretotyping & storytelling. They work in interdisciplinary teams to come up with innovative ideas to solve those challenges through problem curation & customer validation and pitch their ideas for feedback from experts.

Metrics that Matter

- 1079 Students
- 210 Teams
- 35 Innovation Mentors
- 50+ Challenge Statements

Schedule For Innovation Sprints

DAY 1	DAY 2
Day 1 - FN | Introduction & Challenge Curation ● Live Session 1: ○ Introduction to Innovation Sprint ○ Innovation Sprint Syllabus Overview ○ Onboarding of students in Miro ○ Activity 1- Personality Test **Day 1 - AN | Challenge Curation** ● Live Session 2: ○ Design Thinking - Expert Speaker ○ Introduction to Sandbox - Expert Speaker ○ Summary of Day I ● Activity 1 - Identifying the Challenge Statement ● Self-reading by students	**Day 2 - FN | Challenge Curation** ● Knowledge Sessions (Online) ○ Need of innovation tools ○ FORGE Innovation Tool Kit - Introduction video ○ Forge Innovation Rubric (FIR) ○ Product Innovation Hypothesis (PIH) ○ Problem Validation & Customer Discovery (PVCD) ● Activity 2 - Constructing Hypothesis using PIH in Miro board ● Activity 3 - Customer Interview ● Activity 4 - Problem Validation & Customer Discovery Canvas in Miro board **Day 2 - AN | Challenge Curation** ● Knowledge Session (Online) ○ Customer Discovery Tracker (CDT) ● Activity 5 - Capturing the customer interview process to validate the scope, significance, magnitude and incidence in the PVCD canvas ● Activity 6 - Scoring the Product innovation using Forge Innovation Rubric (FIR) Rubric

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DAY 3

Day 3 - FN | Challenge Curation

- Knowledge Session (Online)
  - Introduction to CB & User guide for developing CB
- Activity 7 - Building CB document

Day 3 - AN | Challenge Curation

- Activity 8 - Building CB document

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DAY 4

Day 4 - FN | Idea Generation

- Knowledge Session (Online)
  - Value proposition
  - Identifying pains & gains
  - Crafting value proposition
  - Value Proposition Canvas Explained
- Activity 9 - Crafting Value proposition from the canvas

Day 4 - AN | Idea Generation

- Knowledge Session (Online)
  - Introduction to Concept generation
  - Generating solution concepts
  - Mind Mapping Tools & Techniques
- Activity 10 - Shaping solutions concepts through Mind Mapping tools in Miro board

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DAY 5

Day 5 - FN | Pretotyping

- Knowledge Session (Online)
  - An Introduction to Pretotyping
  - Pretotyping concepts
  - Build The Right It
- Activity 11 - Building the pretotyping concepts

Day 5 - AN | Pretotyping

- Knowledge Session (Online)
  - Difference between Pretotyping & prototyping
  - Fake door pretotype
- Activity 12 - Validating the pretotyping model

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DAY 6

Day 6 - FN | Pitch & Presentation

- Knowledge Session (Online)
  - Art of storytelling
  - How to prepare pitch script
  - How to prepare a presentation
  - Pitch canvas introduction
- Activity 13 - Preparing the Pitch Presentation
-

Day 6 - AN | Pitch & Presentation

- Activity 14 - Preparing the Innovation Proposal

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DAY 7

Day 7 - FN | Assessment Day

- Pitch presentation and Viva Voce

Day 7 - AN |Assessment Day

- Academic Assessments

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20BTT031	SADVIKA N	sadvika.20tt@kct.ac.in
20BTT032	SANJEEV T	sanjeev.20tt@kct.ac.in
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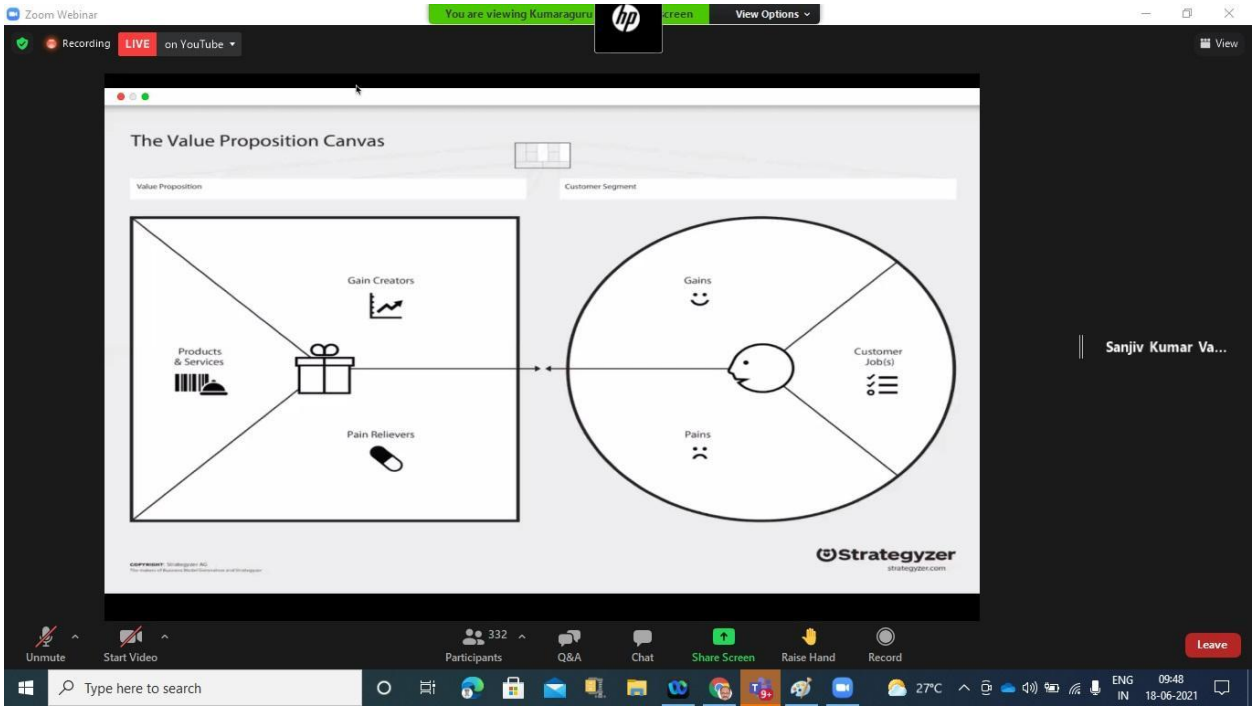
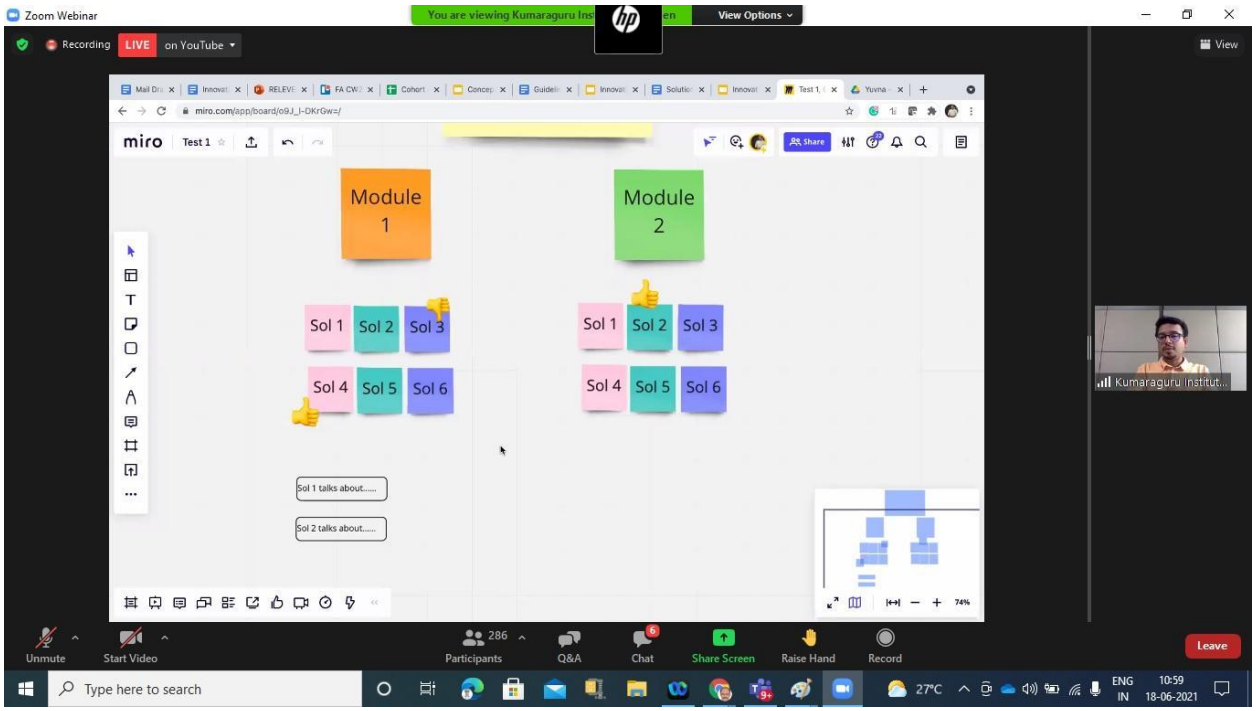
Outcomes

After proper identification of the problem and customer validation of the problem, is to generate a Pretotype and Storyboard

- Provided space and gave team members an opportunity to innovate.
- Promoted learning beyond the scope of day-to-day work.
- Helped to build and strengthen relationships across teams and departments (Interdepartmental)
- Students learnt different employability skills through doing like Design Thinking, finding solutions to technical issues, growing competence and confidence, resolving (if any issues) prepare a demo, team building, planning and time management.

Screenshots





Video Link

Forenoon Session
https://kumaragurudtsteam-my.sharepoint.com/:v:/g/personal/umesh_mv_eie_kct_ac_in/EQ9SjAB2jmpNr3hjzWib98YBMeNJsX9q5DAqFRwdlB5OLw?e=nbAFge

Afternoon session
https://kumaragurudtsteam-my.sharepoint.com/:v:/g/personal/umesh_mv_eie_kct_ac_in/EQXk8H8sGOlIu0IGKxZ10bUBHQQbeVyMqk08qLsPLqKdsg?e=PpRlNf

Short video of 2 min
https://kumaragurudtsteam-my.sharepoint.com/:v:/g/personal/umesh_mv_eie_kct_ac_in/EZMjShx7Q_JOgGIOlOr_W8oBtQGOhMATBULZpGkvitwznw?e=xjpV5E

Youtube link

Innovation Sprint | Day 1 | Session I - https://youtu.be/b-Xo-4MnTy4

Innovation Sprint | Day 2 | Session II - https://youtu.be/vl3NbWPP2Io

KUMARAGURU
college of technology
character is life

FORGE
Your Innovation &
Growth Partner

Design Sprint - Report

II[nd] Year | III[rd] Semester | Innovation Practicum

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Executive Summary

Innovation Practicum drives the institution's innovation outcomes through defined process, methods and frameworks. This facilitates the strengthening of the innovation ecosystem in the Institution, by providing students & educators to build capabilities in innovation, technology and design. The **Innovation Centric Curriculum** delivered in a **Learner Centric Pedagogy** enables transformation of students/educators into Innovation engineers/mentors capable of building innovative solutions for real-world problems. This also becomes a playbook for academic Institutions to foster a state of the art infrastructure conventionally termed as **Centres of Excellence** in partnership with Industry through Government funding schemes like Idea Labs**,** with the capacity of transforming an idea to prototype. The platform essentially helps build a sustainable model to accelerate the number of product innovations, patents, grants, internship and differential employability outcomes enabled by innovation coaches, startup veterans, technology experts and industry professionals.

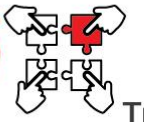
Innovation Practicum comprises a sequence of courses designed at the grassroots levels providing opportunities to identify and harness the real power of technology to solve industrial problems and challenges. It focuses on **Tools, Technology** & **Talent** delivered through Sprints & ProtoSem supported by technical resources, tools, equipment, etc. that are required across the entire spectrum of the innovation process.

Design Sprint, as part of the Innovation Practicum is the course designed & delivered for the second year, third-semester students. The curriculum is tailored to upskill the student innovators with various design principles and rapid prototyping techniques to create innovation outcomes. These principles help them build a shared understanding of a product and service, serving as a springboard for innovation. The system thinking and rapid prototyping techniques enable them to understand the system, learn advanced tools & techniques to create mechanical, electrical, electronics and software prototypes in an iterative method. The course is imparted through a right blend of conceptual learning reinforced by practical application providing a practicum understanding of the necessary steps involved in product designing. The program is offered for the students in an asynchronous mode and implemented through multidisciplinary teamwork. The flipped classroom is adopted to actively engage the student when working in a team and also kindles out of the box thinking. The course was piloted at Kumaraguru college of technology during the AY2020-21 for 1200+ students facilitated by 40 innovation mentors.

Metrics that Matter

1289  Student Innovators

40  Educators

225  Transdiciplinary Teams

10600+ 

No.of.Videos Streamed

590+  Minutes of Content Streamed

15  Departments

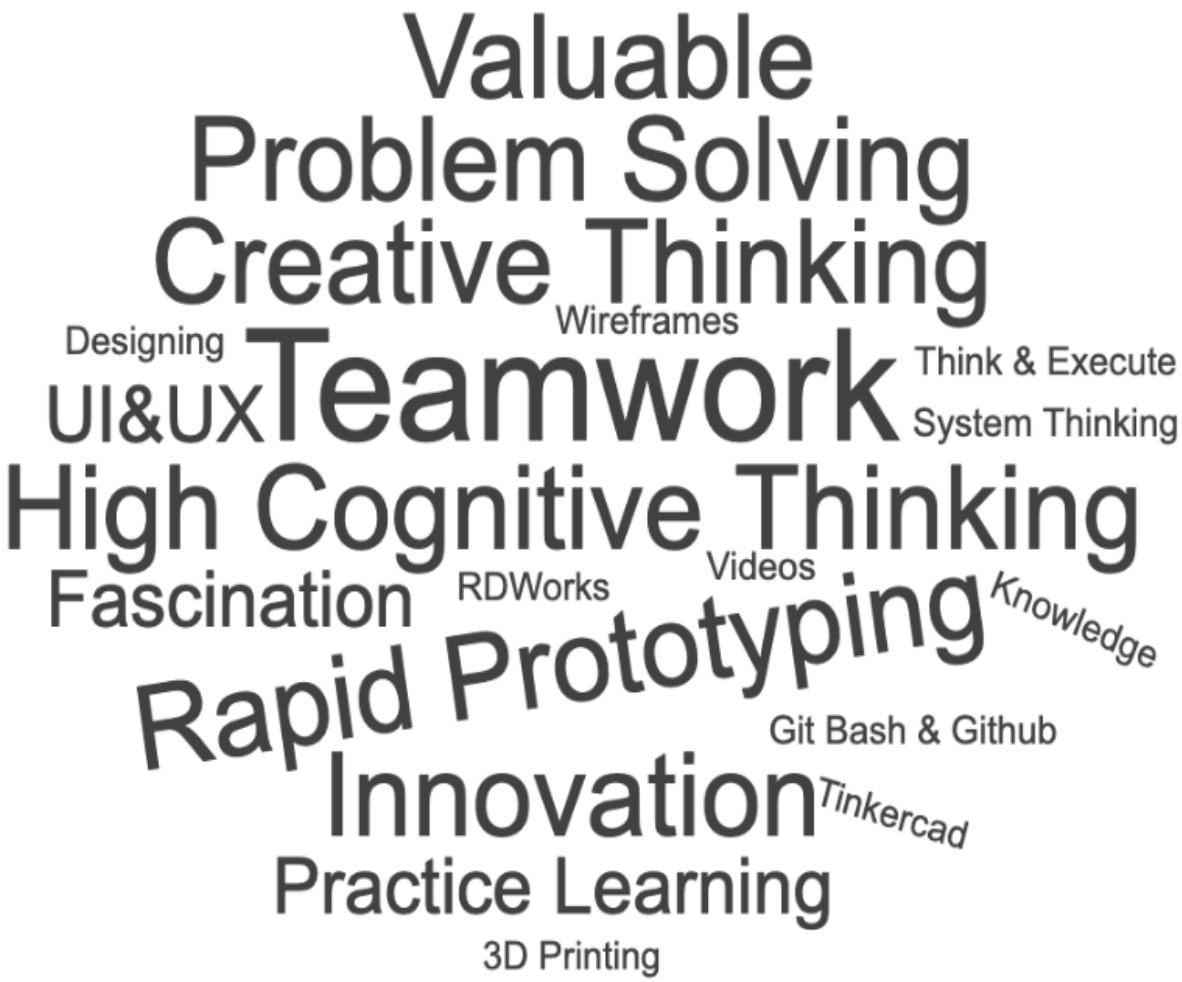
216  Man Hours in Design & Development

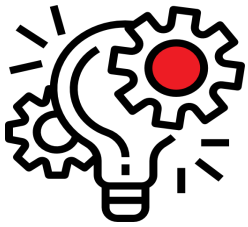
100  Man Hours of Implementation

15  Expert & Mentor Session Per Cycle

38  Assessments

Voice of Students





Program Framework

Design Sprint has been designed & developed to upskill the protagonists as product engineers from the perspective of design and support them with tools & techniques to prototype rapidly. The course also nurtures the curiosity and creativity of the students and gives a shape to their ideas through hands-on on new-age technologies. This would aspire them to pursue a career towards technology, innovation and entrepreneurship with a design sense.

System Thinking focuses on the system as a whole and its different correlations to the product. Rapid prototyping enables the students to build the product efficiently in an iterative manner. Modules, Design as a Language and User Interface & User Experience gives various design principles and the user experience for designing a product.

The modules “Systems Thinking” and “Rapid Prototyping fundamentals” were designed and developed by Forge. The modules “Design as a language” and “User Interface & User Experience” modules were developed by SPREAD.

Module Heads & Hours

	#	Module Heads	Module hours
Learning Modules	I	Design as a Language	15
	II	System Thinking and Reverse Engineering	15
	III	User Interface & User Experience	15
	IV	Rapid Prototyping	15
		Total Hours	**60**

Outcomes

	Upon the successful completion of the course, the students will be able to,	
Learning Outcomes	1	Understand the elements and principle of design in the context of product and service design
	2	Apply system thinking to reverse engineer a prototype and understand its internal components and their correlations

	3	Apply user research techniques to meet UX needs of a customer and design a visual prototype
	4	Use tools to create mechanical, electrical and SW prototypes in a quick iterative methodology

Syllabus

Module I	Design as a Language
Introduction to Visual Design, History and Modernism, Design Thinking methodology, seven elements of design, principles of design, principles of good design, designing a product and a service	
Module II	**System Thinking and Reverse Engineering**
System Thinking, Understanding Systems, Examples and Understandings, Complex Systems, Reverse Engineering Methodology, Identify building blocks/Components - Re-Engineering a complex system	
Module III	**User interface & User experience**
Introduction to UI/UX, Human-Computer interface, user-centred Design Principles, User research techniques, UX Design workflow, Information Architecture, UI Components, need for UI prototyping, Wireframes	
Module IV	**Rapid Prototyping**
Introduction-Need for prototyping - Domains in prototyping - Difference between actual manufacturing and prototyping - Rapid prototyping methods - Tools used in different domains **Mechanical Prototyping**-Introduction - Working with Fusion 360 - 3D Modelling - 3D Printing and classification - Laser Cutting and engraving - RD Works - Additive manufacturing **Electronic Prototyping**-Introduction to Lumped Circuits - Electronic Prototyping - Tinker CAD - Designing in KICAD - PCB design **Software Prototyping** -Source code management and version control - GitHub - GitHub Actions - GitBash - Continuous Integration - Platform as service - Heroku - Build Packs	

Evaluation Criteria/Methodology

Quiz / MCQ	Assignment	Total
20	80	100

Design sprints in terms of Tools, Technology & Talent (TTT) of Innovation Practicum

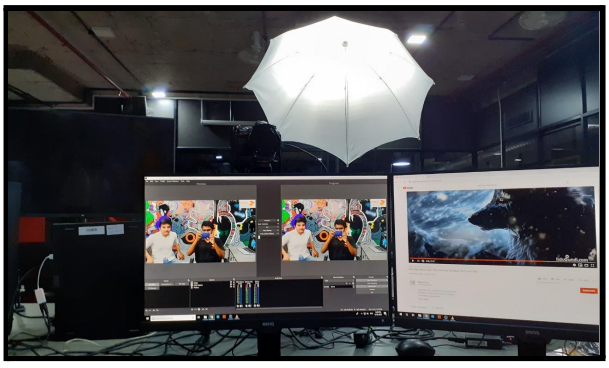
	Tools	Technology	Talent
Module I - Design as Language	- 5 Stages of the Design Thinking Process - 10 Principles of Good Design	- Elements of Design - Principles of Design - Product and Service Design	- Apply design thinking process - Apply the design principles for product development
Module II - System Thinking & Reverse Engineering	- Four Tasks of a System Thinker: Task 1, Task 2 Task 3 & Task 4 - Causal Loop Diagram	- System Thinking - Reverse Engineering	- Apply system thinking and the entities involved, their relationships - To develop causal loop diagrams for understanding the operations of a system - To perform reverse engineering to understand its internal components and their correlations
Module III - UI & UX	- UX UX: Tools and Techniques - Prototyping Techniques	- Visual Design - Wireframes	- To perform the UI UX Workflow of project - Understand low fidelity prototyping for an application - Creating wireframes
Module IV - Rapid Prototyping	- Fusion 360 - Slicer Software - RDWorks Software - Tinkercad - KiCAD - Git Bash & GitHub - Heroku	- Mechanical Prototyping - Electronic Prototyping - Software Prototyping	- Perform Slicer operation - Perform 3D print operations - Design a PCB board - Select appropriate components for PCB - Develop and deploy the application on Heroku

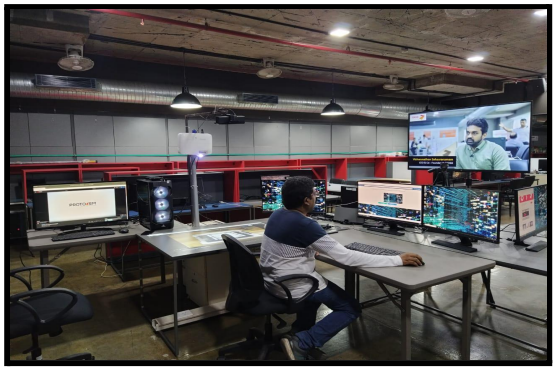
Program Design & Development

The goal of the course is to enable students with core competencies in critical and creative thinking for design aspects, skilful communication through UI & UX, and demonstrate rapid prototyping. The design sprint pedagogy is designed to be an active and student-centred approach resulting in a dynamic and interactive learning environment where the mentor guides their students in problem-solving as they apply core concepts.

The curriculum is designed for a self-paced consumption with mentor hours for the students to engage in various learning activities and problem-solving. Teams are structured with transdisciplinary teams to bring out breakthrough ideas and disruptive innovations for prototype development. The educators play the role of innovation facilitators.

Course Development: The Design sprint content was designed and developed by the team Forge and SPREAD using software's like Open Broadcaster, Open Shot and Kdenlive. Some of them are open-source cross-platform used for streaming and recording software that was built with Qt and maintained with OBS Project.



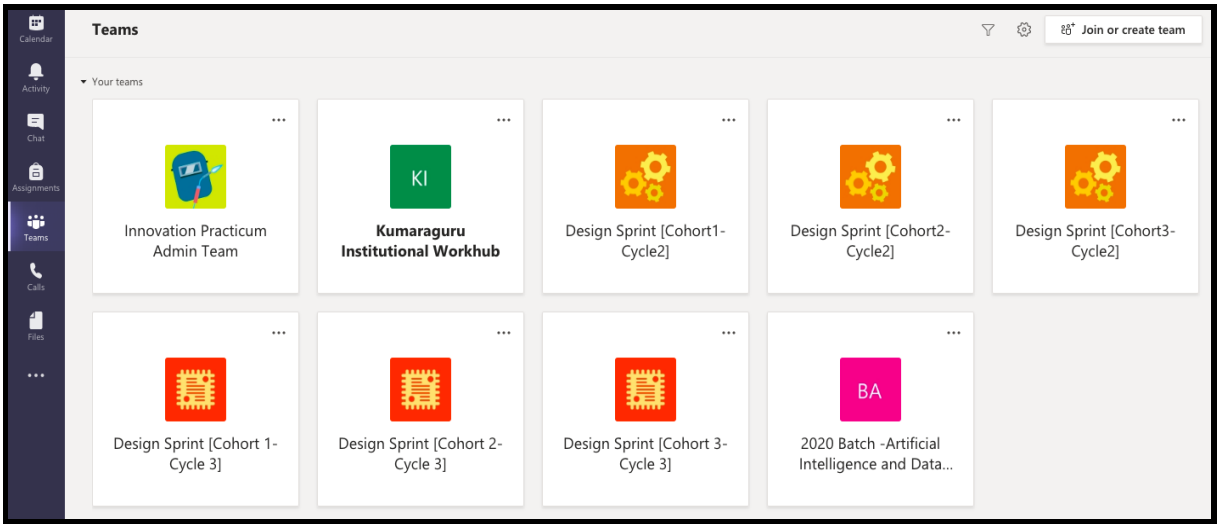


Innovation Practicum was designed and developed in three stages - content creation, content delivery and cloud hosting. The developed course content was hosted using the Open edx platform and Amazon Elastic Compute Cloud. The use of Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides secure, resizable compute capacity in the cloud. It is designed to make web-scale cloud computing easier.

The content delivery was offered through Amazon Simple Storage Service (Amazon S3) which provides object storage through a web service interface and Amazon CloudFront which is a content delivery network. It can be used as a globally distributed network of proxy servers that cache content, such as web videos or other bulky media, more locally to consumers, thus improving access speed for downloading the content. Some of the content was also hosted on YouTube for quick access.

MS Team Set up: The entire execution of the design sprint was initiated through an online platform - MS Team. Before the initial setup for the transdisciplinary team and its effective execution. It was a mandate to understand the platform. Learning the various

hierarchies & elements via documents & online resources was the initial step. User trials were carried out in the platform and studied for the gaps to overcome. Once the trial was successful, a formal request was initiated with the IT department to create the necessary cohorts for the Sprint and include Forge members & institute mentors, as the class owner. The challenge was to create more number of private channels for the respective teams and hence the private chats were created for the respective mentor with their students. The mentor-mentee mapping was carried out to have the interdisciplinary teams and they were added in MS Teams with their respective cohorts.



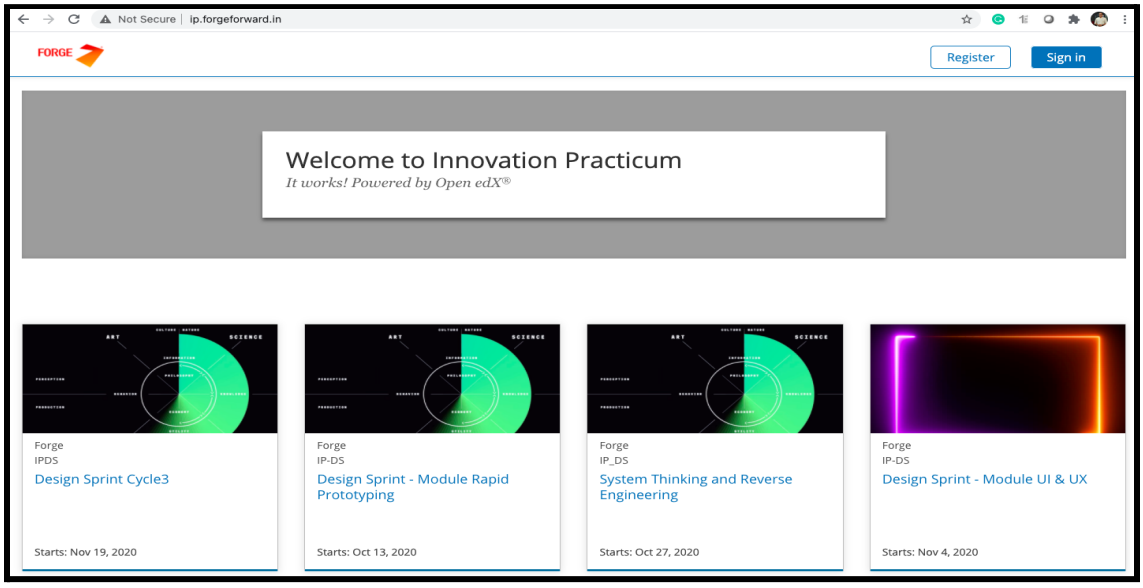
Each Mentor was assigned with 5 to 6 teams with 6 students in a team. All the students with the same mentor were added with the private channel, enabling the mentor to have a common platform for their communication with all their teams.

User Trials with ProtoSem Students: Before productising, it is necessary to run a few user trials to get critical feedback. Here while developing the content in the OpenEdx platform, logins with various domains were created for the ProtoSem students to identify the gaps and challenges. Numerous user trials with the students were conducted, tested and issuers were rectified. The user trials include account creation in the OpenEdx platform, authentication of the account, security issues, video streaming and quality checks, buffering speed and navigation, multi-platform support and multi-user support for stability.

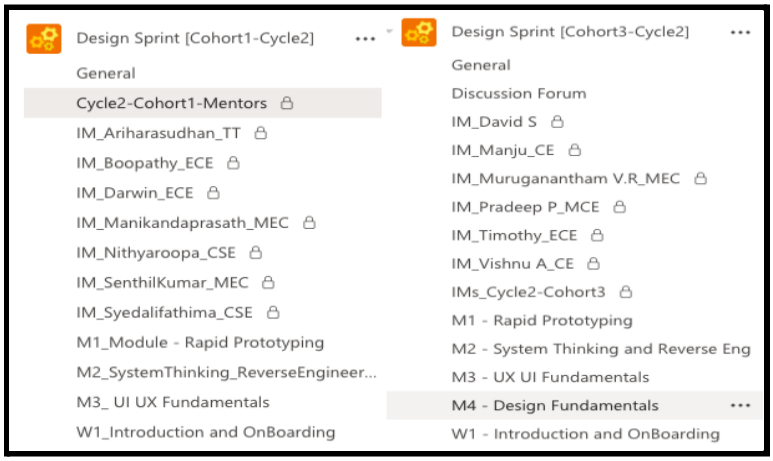
Learning Management System

The blended learning for the design sprint uses three major platforms like Open Edx, MS Teams and MYCAMU for administration, mentoring, assessment, tracking attendance, and delivery of educational course content. The learning management system (LMS), is used for both asynchronous and synchronous communications and team management among students.

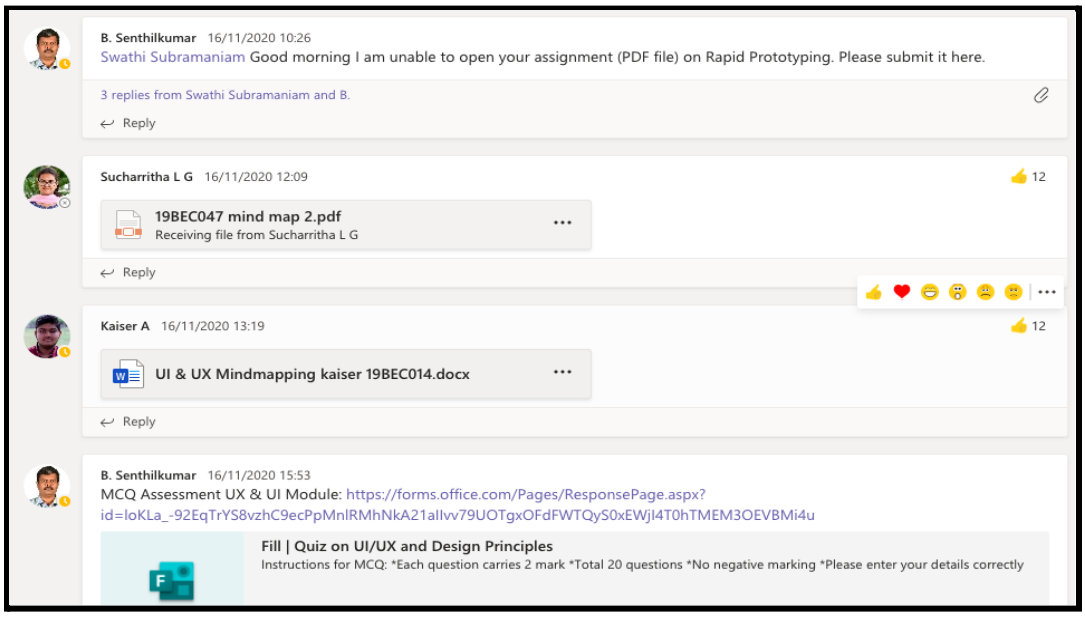
OpenEdx Platform: The Design Sprint course has been developed and hosted in an open edx learning management system (LMS) using Studio. The studio is the Open edX tool that you use to build your courses. Studios were used to create the course structure and then add course content, including problems, videos, and other resources for learners. It is used to manage the course schedule and the course team, publish each part of your course, and more. The Studio can be directly used using a browser. The LMS is the Open edX tool that learners use to access course content, including videos, textbooks, and problems, and to check their progress in the course. The LMS is used directly through a browser. There is no need for any additional software. Innovation Practicum utilizes AWS for their cloud offerings, and Bitnami's distribution runs all cloud infrastructures for the security aspects.



MS Teams: Microsoft Teams is a digital hub that brings conversations, content, assignments, and apps together in one place, letting educators/mentors create a vibrant learning environment for the student community. Within Teams, mentors can quickly converse with students by forming chats or groups, share files or documents necessary for the learning curve and assign polls, conduct and distribute graded assignments. Separate cohorts were formed under each cycle, with the respective educators/mentors and the students. Public channels were created to carry out the discussion related to the specific module. All the technical and non-technical queries, reading materials and important communications were made in these public channels.

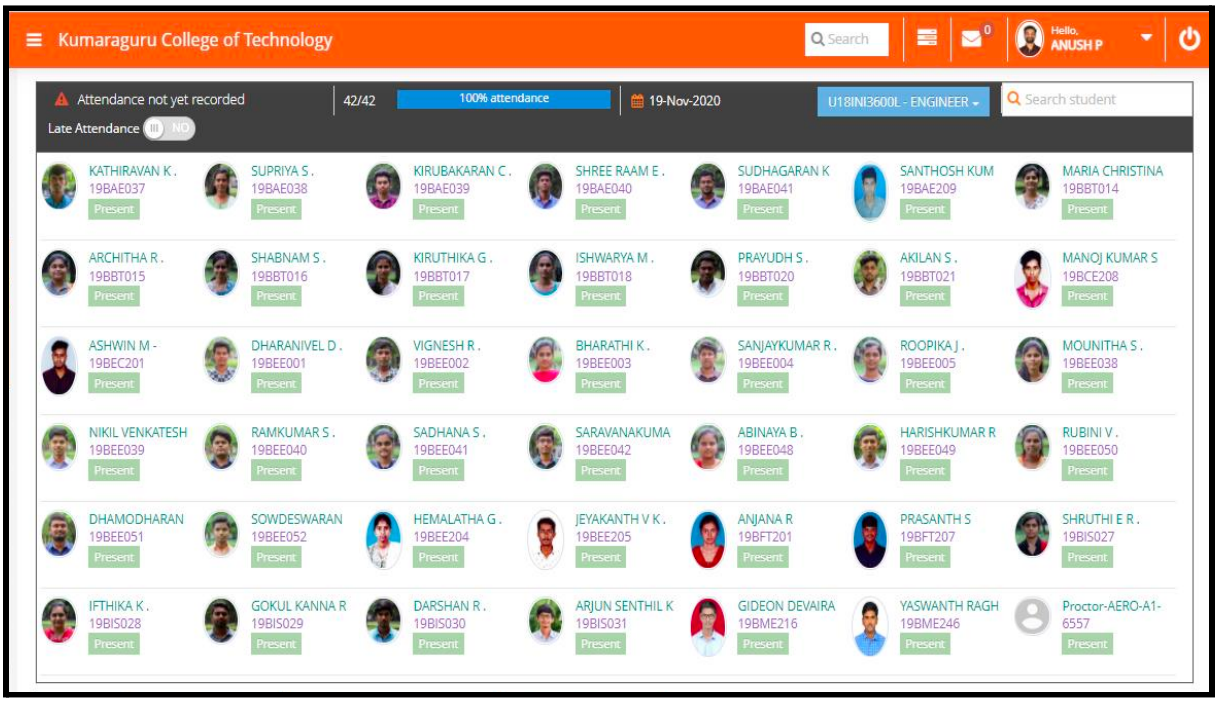


A private channel was created for every educator/mentor and the respective students from the interdisciplinary departments were added. The mentor used this platform to communicate with the students and also to schedule meeting If necessary for the discussion.



My Camu: My Camu is a school-home collaboration portal. It is used to map and track the attendance of the students. The interdisciplinary students were mapped with the respective mentors and the attendance of the students were administered through this platform.

For the time table assigned, a meeting will be scheduled between the educators and the students, in the MS Teams. Students need to login via the My Camu portal for the mentoring hour and the attendance will be marked present to the respective. This portal was integrated with MS Teams and the mentors use MS Teams platform for all the teaching - learning activities.



Program Implementation

The stages of implementation range from learning materials for self-consuming to the execution of learning activities. The session plan is suggested for the program implementation. The mentors have all the liberty to modify and execute activities during the mentor hours depending on the team dynamics. All assignments have to be worked in teams and the submission is individual for the student.

Program Schedule: The Design Sprint in the innovation practicum is designed to enable flipped classroom learning methodology. A flipped classroom is a type of blended learning, which aims to increase student engagement and learning by introducing the learning content at home and work on live problem-solving during class time. The Design Sprint is enabled for the students to watch the videos prior to the Mentor sessions and the interaction time is used for understanding and problem-solving. A program schedule was created to ensure the day-to-day activities that go on in their mentor sessions and provide students with an adequate level of long – term progress toward the goals outlined in their scope and sequence.

Expert Session 1: Introduction to Innovation Practicum & Onboarding

Suggested activities to be done:

- Introduction to innovation Practicum
- Design Sprint Syllabus Detailing
- Onboarding of students in Innovation Practicum Platform
- Team formation using Miro

Mentor session 1: Module 1 - Design Fundamentals (Design Thinking)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- Assignment 1

Mentor session 2: Module 1 - Design Fundamentals (Elements of Design and Good Design sense)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- Assignment 2 and 3

Mentor session 3: Module 1 - Design Fundamentals (Product & Service)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- MCQ for Module 1 (20 mins)
- Assignment 4

Mentor session 4: Module 2- System Thinking & Reverse Engineering (Introduction to System Thinking)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- Assignment 1

Mentor session 5: Module 2 - System Thinking & Reverse Engineering (Introduction to System Thinking)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- Assignment 2

Mentor session 6: Module 2 - System Thinking & Reverse Engineering (Reverse Engineering)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- MCQ for Module 2 (20 mins)
- Assignment 3

Mentor session 7: Module 3 - UI UX (Introduction & User Research)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- Assignment 1 & 2

Mentor session 8: Module 3 - UI UX (UX & UI Basics)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- Assignment 3 & 4

Mentor session 9: Module 3 - UI UX (Prototyping & Wireframes)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- MCQ for Module 3 (20 mins)
- Assignment 5 & 6

Mentor session 10: Module 4 - Rapid Prototyping (Mechanical Prototyping)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- Assignment 1

Mentor session 11: Module 4 - Rapid Prototyping (Mechanical Prototyping)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- Assignment 2

Mentor session 12: Module 4 - Rapid Prototyping (Electronic Prototyping)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- Assignment 3

Mentor session 13: Module 4 - Rapid Prototyping (Software Prototyping)

Suggested activities to be done:

- Students should have watched the required videos in the IP Platform before the Mentor Session
- Doubts clarification
- Live Session Quiz
- MCQ for Module 4 (20 mins)
- Assignment 4

Expert session 2: Expert Session

Suggested activities to be done:

- Expert Talk

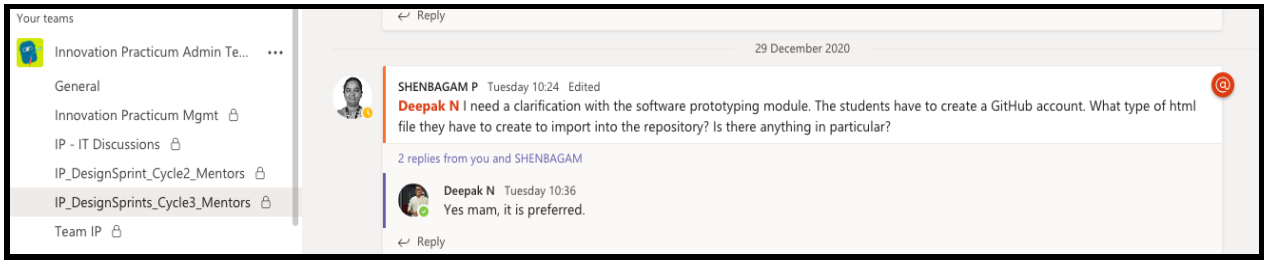
Mentor - Mentee Mapping: Under each cycle, separate cohorts were formed for each mentor-mentee team in order to have a seamless execution of the program since the volume of participants was large. There were 3 Cohorts (Cohort 1, Cohort 2 & Cohort 3) under each cycle. With each cohort, transdisciplinary teams were made in order to attain the defined outcomes.

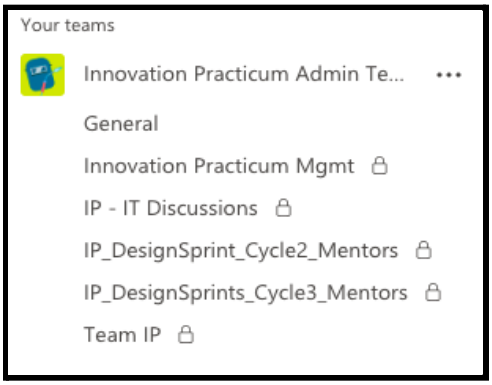
The Mentor-Mentee mapping was carried out to form teams of transdisciplinary teams. The students of various disciplines were formed together as a team and will be led by the Mentor for problem-solving. These teams involve in appropriately utilizing knowledge, skills and best practice from multiple disciplines to redefine, re-scope and reframe the challenges involved and to reach solutions based on an improved collective understanding. The results showed that these teams lead to a better understanding of the collaborative process, and how different professions complement has a positive effect on problem-solving with a sense of achievement. There were a total of **225 transdisciplinary teams with 40 mentors.**

Mentor Name	Mentor Mail ID	Team name	Team Member 1			Team Member2			T	
			Roll No	Name	Dep	Roll No	Name	Dep	Roll No	
R.Vijayanandh _Aero	vijayanandh.r.aeu@kct.ac.in	C1_Team 1	19BEE001	DHARANIVEL D	EEE	19BEE048	ABINAYA B	EEE	19BAE037	KATHIRA
		C1_Team 2	19BEE002	VIGNESH R	EEE	19BEE049	HARISHKUMAR R	EEE	19BAE038	SUPRIYA
		C1_Team 3	19BEE003	BHARATHI K	EEE	19BEE050	RUBINI V	EEE	19BAE039	KIRUBAK
		C1_Team 4	19BEE004	SANJAYKUMAR R	EEE	19BEE051	DHAMODHARAN B	EEE	19BAE040	SHREE R
		C1_Team 5	19BEE005	ROOPIKA J	EEE	19BEE052	SOWDESWARAN K	EEE	19BAE041	SUDHAG
		C1_Team 6	19BBT014	MARIA CHRISTINA LINCY	BIO	19BBT015	ARCHITHA	BIO	10744	santhoshk
		C1_Team 7	11130	hemalatha	Department of	11174	prasanth	Department of	10860	manojkum
G.Raj Kumar _Aero	rajkumar.g.aeu@kct.ac.in	C1_Team 8	19BEE006	AARON JOTHI A J	EEE	19BEE053	GAYATHRI U	EEE	19BAE042	HARIBAL
		C1_Team 9	19BEE007	RAHUL R	EEE	19BEE054	THARUN T	EEE	19BAE043	UDHAYAK
		C1_Team 10	19BEE009	MOHIT KUMAR R	EEE	19BEE055	SRIDHARAN R	EEE	19BAE044	ABINASH
		C1_Team 11	19BEE010	GUHANESH L	EEE	19BEE056	JAYAPRABHA KARTHIKKAA K	EEE	19BAE045	KISHORE
		C1_Team 12	19BEE011	HARSHITH S	EEE	19BAE001	ARAVINTHA KRISHNAN B	AERO	19BAE046	JANANI T
		C1_Team 13	10768	karthikeyan	Department of Aeronautical	8426	tharanidharan	Department of Electrical and	10778	geetha
		C1_Team 14	10733	eswar	Department of	10741	saisanjay	Department of	8360	harishkum
Balaji V R _EEE	balaji.vr.eee@kct.ac.in	C1_Team 15	19BEE012	RAZIL A	EEE	19BAE002	AKILESH M	AERO	19BAE048	RAMAKR
		C1_Team 16	19BEE013	POOJAVARSHINI S	EEE	19BAE003	SAKSHIT SHARMA	AERO	19BAE049	MUKESH
		C1_Team 17	19BEE014	PON LALITH PRASATH M	EEE	19BAE004	AISHWARYA VARSHINI G	AERO	19BAE050	HARIHAR
		C1_Team 18	19BEE015	AKILAN K	EEE	19BAE005	OVAIS AHMAD MEER	AERO	19BAE052	SNEKA S
		C1_Team 19	19BEE016	SOWMIYA VAANI N	EEE	19BAE006	AISHWARYA A	AERO	19BAE053	MOHAME
		C1_Team 20	10815	gokulkrishnan	Department of Aeronautical	8429	vengadash	Department of Electrical and	10797	sakthi ma
		C1_Team 21	10854	jothikrishna	Department of	10761	sangeethkumar	Department of	10877	mohamed

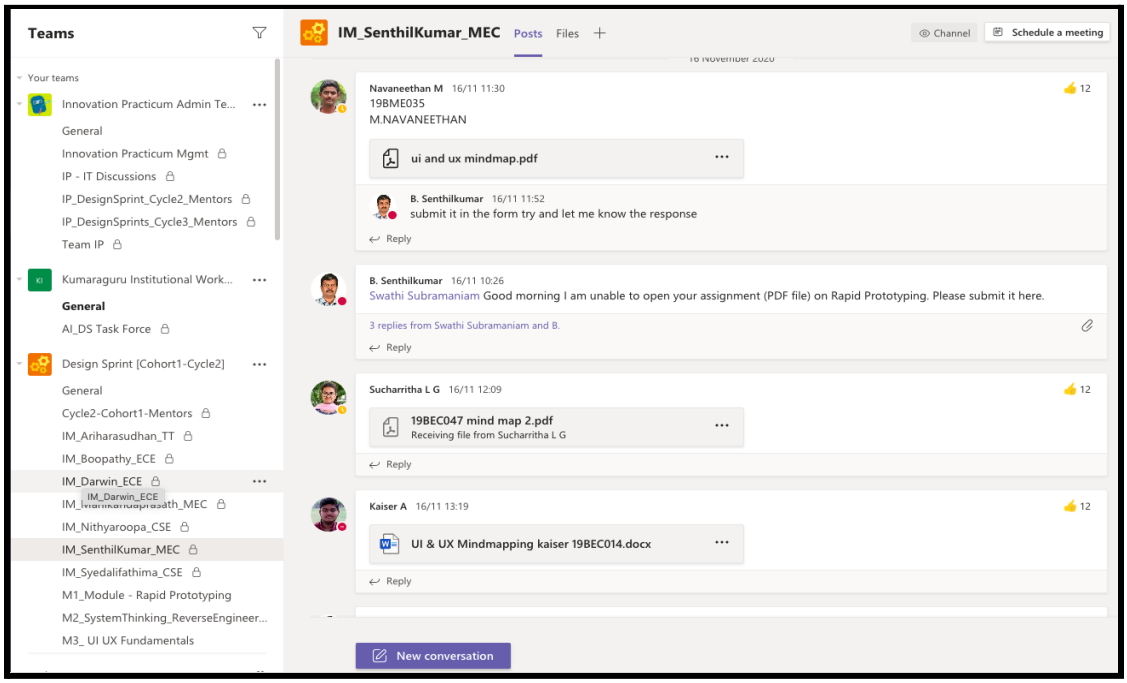
Channels of Communication: Various communication channels in MS Team were used for the coordination and execution of the program.

Mentor Channel: The communication medium was using MS Team for both cycles. A separate channel for each Cycle was used for the respective mentors and the team Forge, where all the discussions and deliberation used to be carried out. All the mentors were quite active in understanding their roles and responsibilities for the successful execution of the Design Sprints. All the queries from the mentors were addressed immediately for smooth implementation. This channel was also used to schedule the weekly mentor meetings.

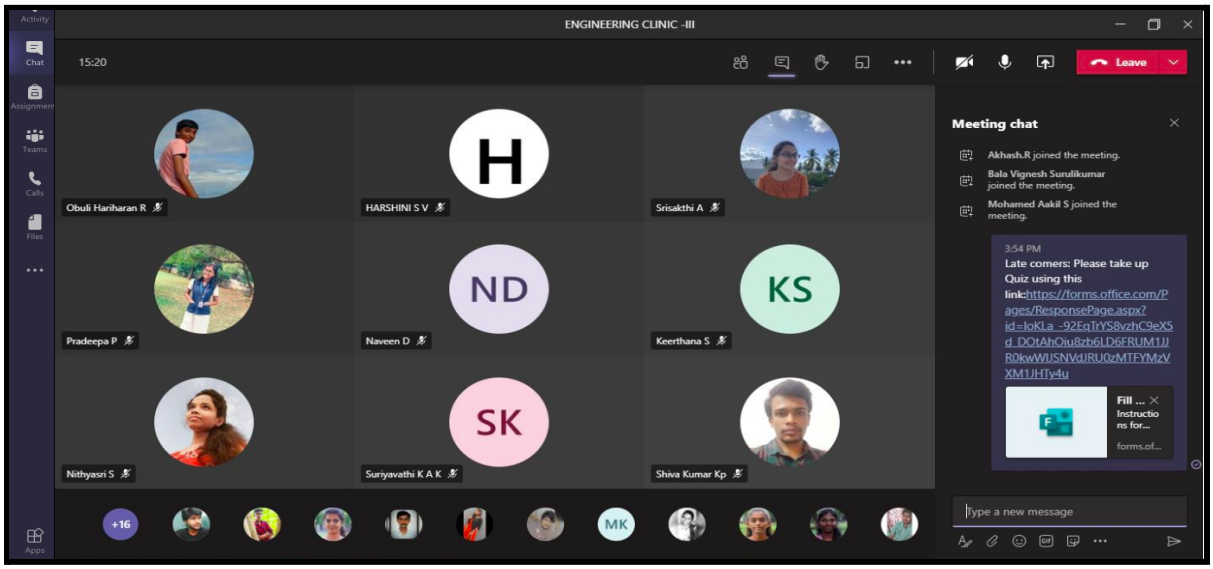




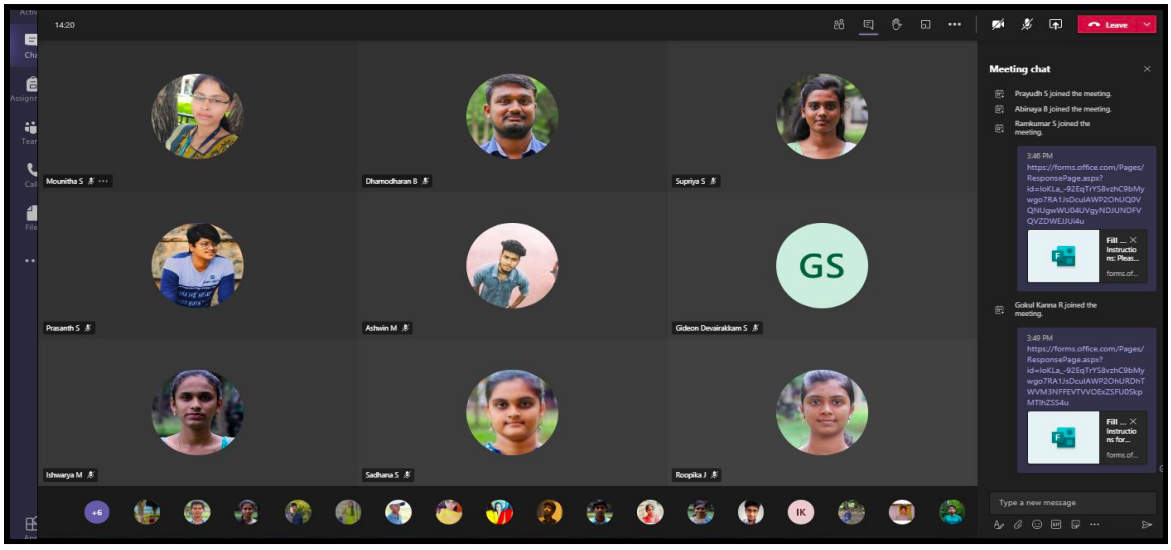
Mentor Mentee Channel: A separate mentor-mentee channel was created for each mentor of the respective cohorts in MS Teams. The mentors will be able to communicate or carry out the offline discussion apart from their mentor hours or even to pass any information/instructions to the team. A separate chat channel was also created for team level interactions. Students often used to schedule meetings by themselves in order to communicate among the team for problem solving and discussions.



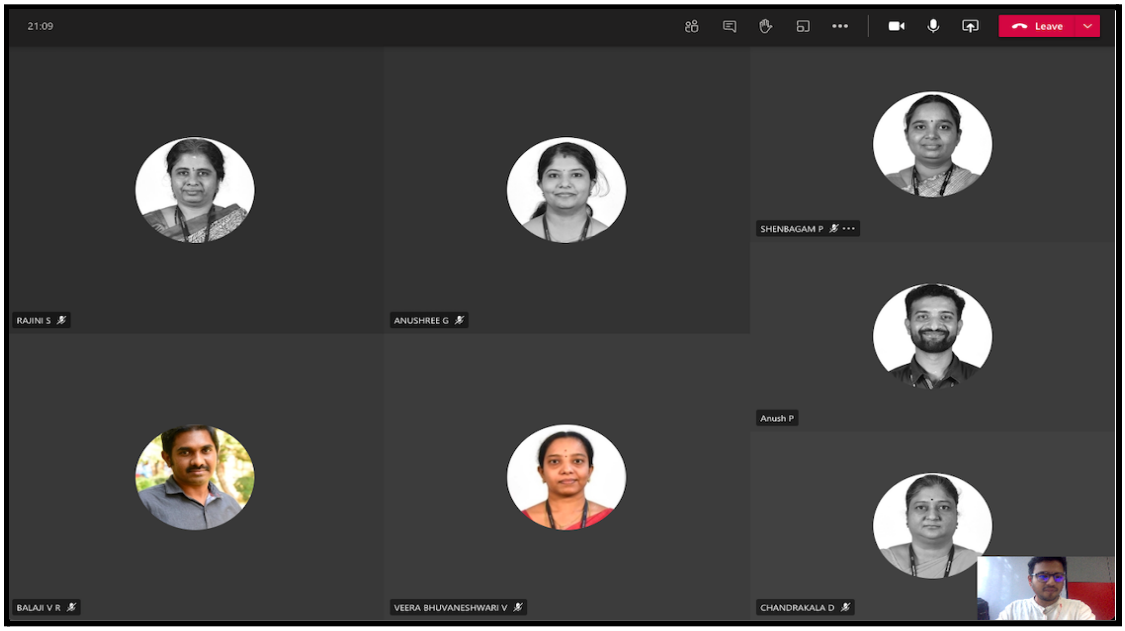
Mentor Hours: The mentor hours were scheduled using CAMU. The students will log-in via KITE-CAMU. The Design Sprint is designed and excited in the same fashion as a flipped classroom learning methodology. The students need to watch the videos prior to the Mentor sessions and the Mentor Hour is used for the interaction and clarifications. All assignments have been suggested to be worked in teams.



The MCQs were conducted during the mentoring hour by the respective mentors. Students use these mentor hours to share their thought process to validate their solution for the defined problem or solving assignments. Mentors will be guiding and monitoring the students when they brainstorm.



Weekly Mentor Meeting: As mentors were the anchors of the program, understanding the concerns from the students and also from the mentors were of utmost importance. The issues or the concerns raised by the mentors were addressed and also documented.

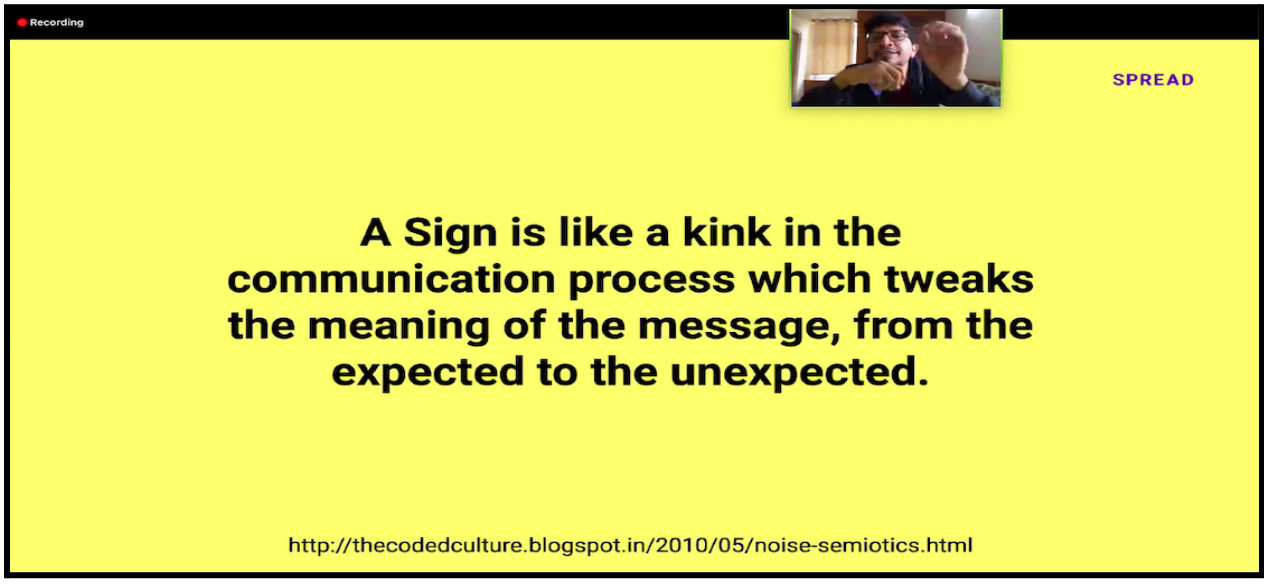


The mentor meeting was organized on a weekly basis on Wednesdays, 05:00 pm. The major agenda of the mentor meetings is to get the mentor feedback on the respective module (Content, Curriculum & Learning), feedback on the team dynamics & their learning, updates on the assignments, assessment & scoring methods, feedback on any challenges by the mentors and attendance related concerns.

Value Added Services

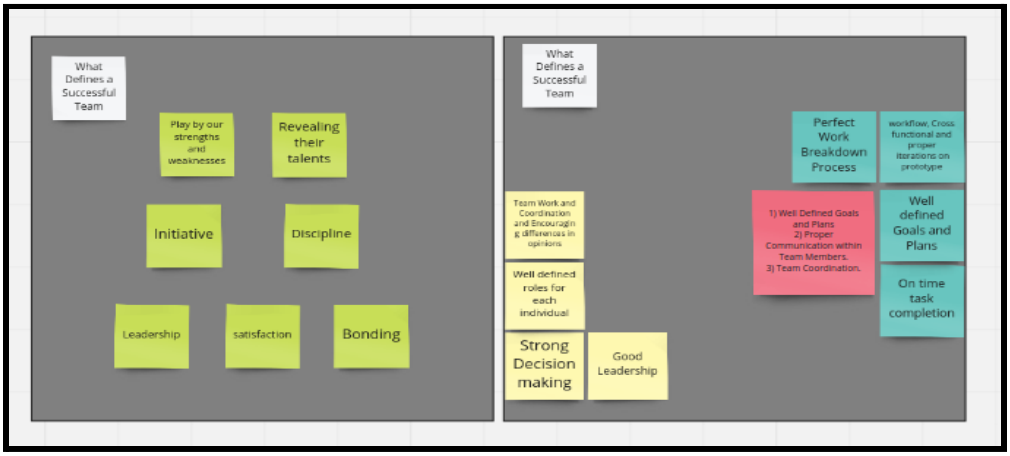
Capacity Building Sessions by SPREAD: Understanding the design elements and various principles plays a significant role in any product design. The knowledge of various research techniques to meet UX needs of a customer and the design of a visual prototype is important for any product design & development. The modules “Design as language” and the “User Interface & User Experience” were specially designed and developed by SPREAD, for the students of varying engineering disciplines.

It is necessary to build the capacity for the mentors, who will be mentoring the students and kindle their thought process of the science of the design behind any product development. SPREAD has conducted 2 days workshops for both cycle mentors, imparting the sense of design, and its principles. They also explained about the assignments and its assessment methods to be followed



Expert Hours: The expert hours were conducted by the team Forge for the Students of each cohort. The onboarding procedure includes the introduction of Innovation practicum, Introduction of Design sprint, Personality identification, Zen Pencils, Onboarding in Innovation practicum platform, and team formation.

Miro - A tool for collaborative work was introduced for the team activity. Miro is a platform where the team can visually collaborate at any time anywhere across and work as a team. The team was working on their assignments and other problem-solving discussion by sharing their ideas at the same time in a common platform.



Assessments & Assignments

The assessments are important criteria to understand the level of knowledge that the students possessed for the particular course. The assignments are designed in such a way that it provokes the student to spark up their knowledge. All the assignments were intended to assess their higher-order cognitive level. The assignments were recommended to work as a team since the students were formed from various disciplines. With working in teams, the students will be sharing their thoughts on problem-solving and can come up with an out of the box solution.

There were a total of **17** assignments, **4** MCQ, **1**3 Mentor Hour Quiz and **4** Peer Assessment. All the assignments were conducted using MS Forms. The due date was scheduled for each assessment and was circulated to the students for them to work as a team and complete the same. The Peer assessment was made mandatory as part of the assessment to enable the active participation of students in teams. Since the students were from different disciplines, it was necessary to bring the students to open up among the team and participate. Moreover, peer assessment was included to bring the right attitude among the students to work as a team. For which students were assessed and made to realize the importance of parameters like

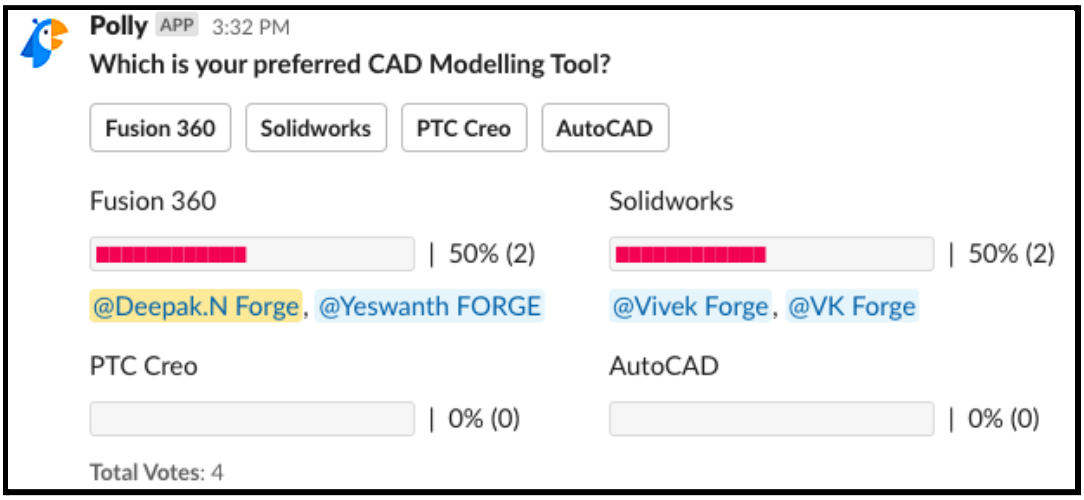
- Student participation in a team,
- Involvement in building solutions,
- Treating others respectfully,
- Sharing the workload fairly,
- Ability to take constructive feedback and
- Time Management to work in a team.

Conduction of Peer Assignment

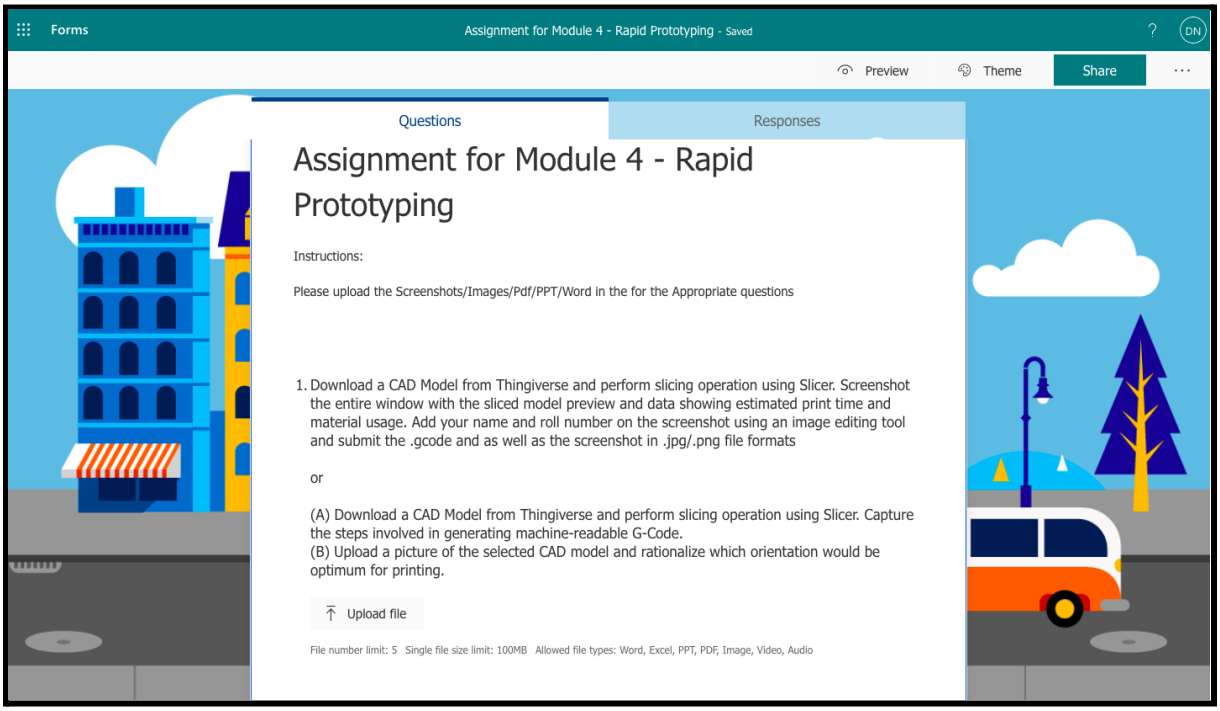
The mentors are requested to map the students across other members of the same team, asking for peer assessment. A small percentage of the peer-assessment were included as part of each assignment, to motivate the students for their involvement to work as a team. The peer assessment was collected at the end of each module. The

students were mapped to assess their peers of the team based on their contribution towards the problem-solving.

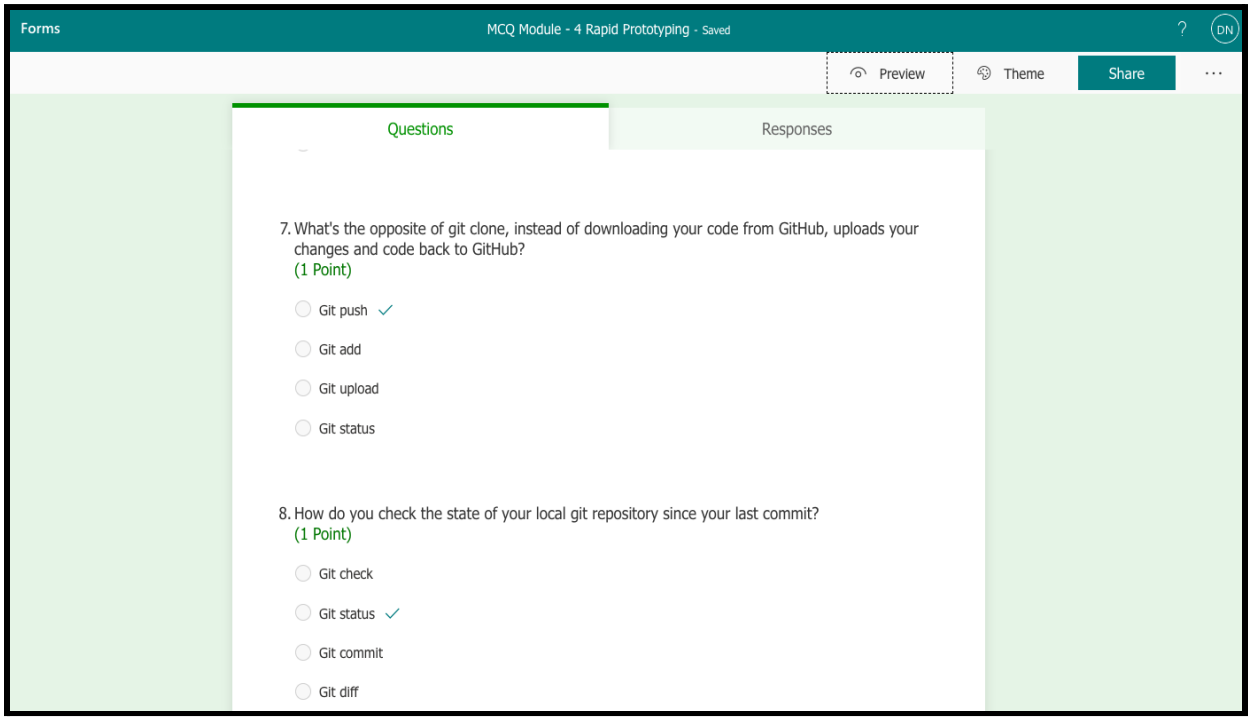
Live polls during the mentoring hour will help to effectively collect the students' insights, test their knowledge, or fire up a discussion. A set of simple quiz/Polls were created and recommended to use, via "**Polly**" in MS teams.



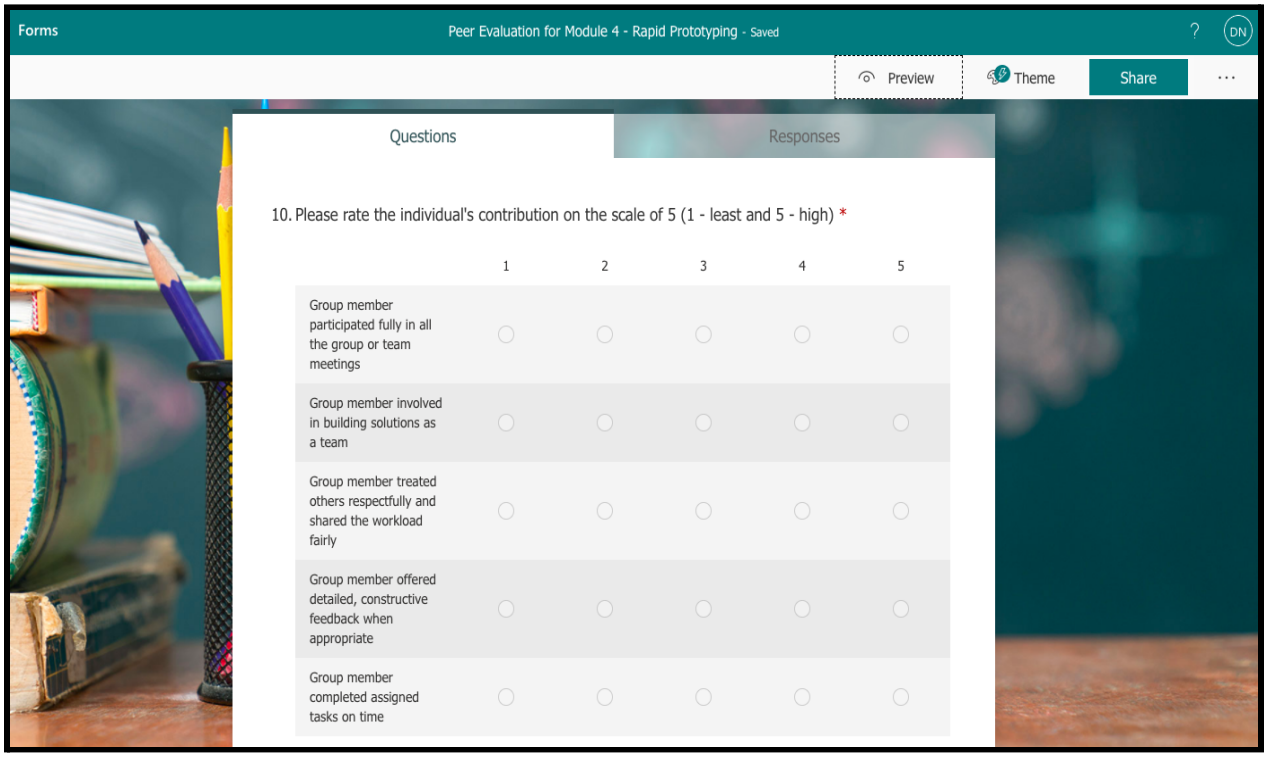
Sample Assignment in MS Forms:



Sample MCQ in MS Forms:

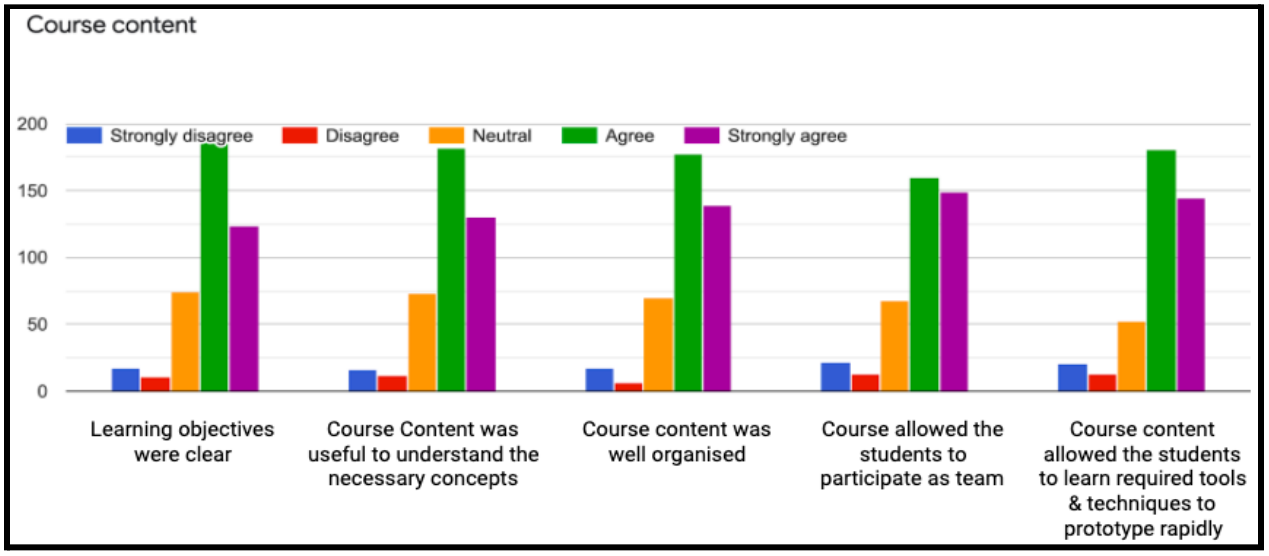


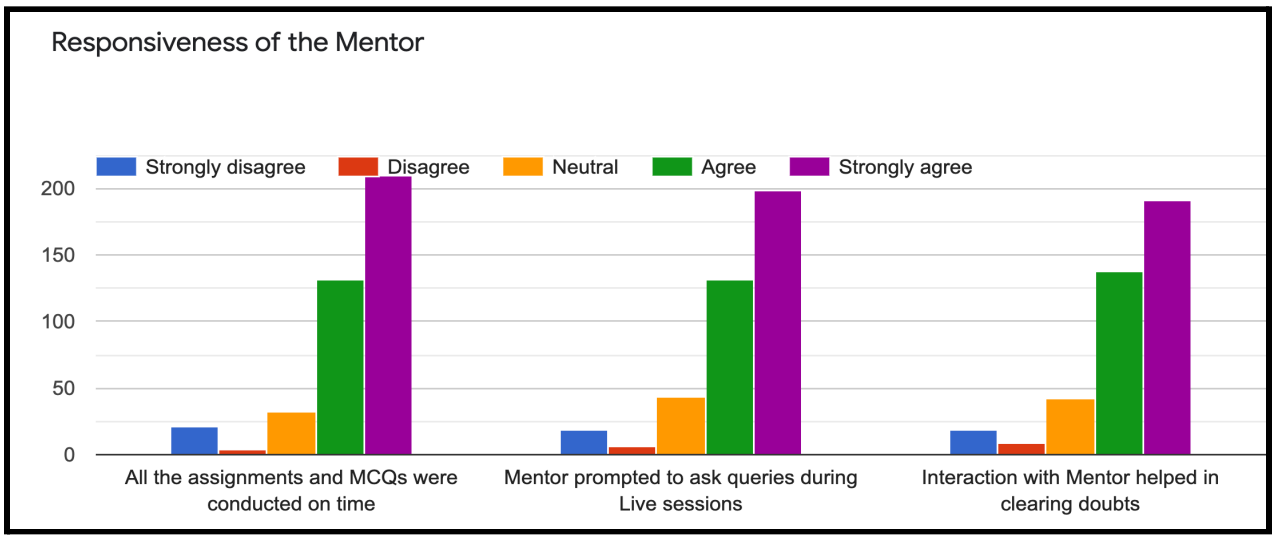
Sample Peer Assessment in MS Forms:

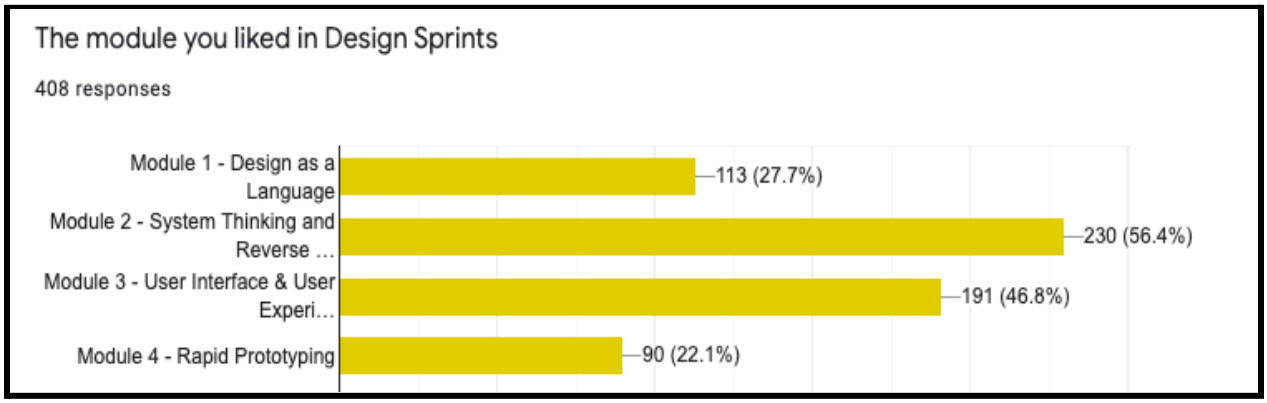


Feedbacks & Suggestions

Feedback is valuable information that will be used to make important decisions. The feedback and suggestions were taken from the students and as well from the mentors to know more about the course curriculum, structure, assignments etc. The overall feedback was positive among students and mentors. The responses received from the students are shown below for the respective questionnaire:







What aspects of this course were most useful or valuable?

247 responses

The fact that students could work as a team which increases the student's interest towards this course.

videos

Thinking creatively

No special ones.

DESIGNING

It's very useful..

Working as a team

Student interaction

Design

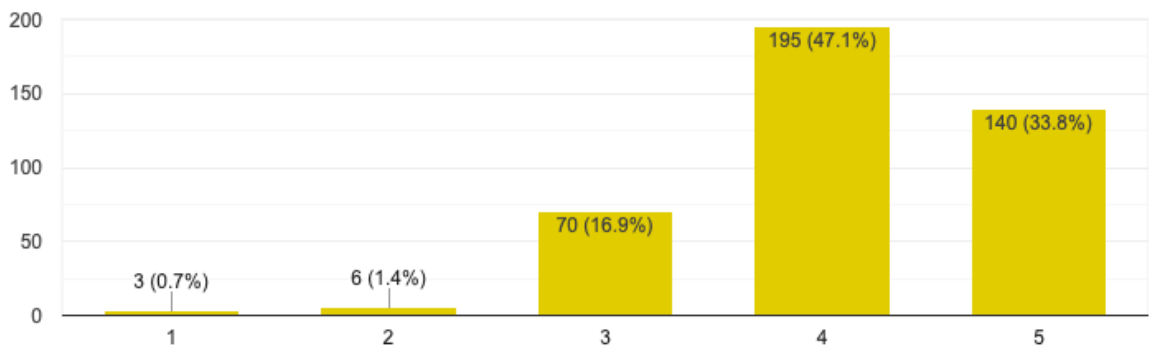
Your suggestions to improve this course?

219 responses

- Provide sufficient time for learning
- ALREADY ITS PERFECT
- To learn more
- No suggestions but one thing i was marked absent for one of those introduction classes though i was present for that class
- Less content more activity
- Guidance was not clear, so make it a little clear.
- Reduce mentor sessions to 2 classes a week as it was not allowing us to focus on the course content.
- Its already fine
- It's good

Rate the Overall Design Sprint Course

414 responses



Testimonials - Mentee

Alden Binoy C (19BME104) - “The fact that students could work as a team which increases the student's interest towards this course”

Monika M (19BEC083) - “According to me the valuable outcome is I got to know about all the other domains since we have worked in a interdepartmental team and I learned a lot about teamwork”

Kaiser A (19BEC014) - “Prototyping and UI/UX were the most useful and taught properly”

Dhaarani.G (19BCS035) - “Collaboration with various fields and got to know a lot of things apart from our respective fields and got to know how teamwork was!”

Sruthi S (19BEC028) - “It made us learn something better about the concepts known previously and taught some new technique too”

Koliyar Nikhil Durairaj (11146) - “The learning of Design thinking, System thinking and Reverse engineering, UI and UX and Rapid Prototyping were very useful for my career and this course also developed my teamwork skills”

Bavatharani k (19BBT012) - “It makes us to think apart from the course”

Gokila N M (19BIS040) - The best aspect of the course is rapid prototyping. It is most useful and it also seems interesting and allows you to learn something new.

S.B.Kanniga gayathri (19BMC003) - “The last module was practical and occupied my area of interest and gave a proper and basic gist of what the major domains in engineering practically mean”

Sabarish G (19BEI015) - “The perspective of looking at a design was made very clear. The importance, need, and value-addition of Designing was understood”

Vishal N R (8430) - “The perspective of looking at a design was made very clear. The importance, need, and value-addition of Designing was understood”

Sakthi N (19BAU006) - “This course has raised up the thinking process. In every module around 95 percent is new and informative. It's astonishing that it is still the basic information we have learned in this course leading to think about the depth of each thing, whether it might be design thinking or reverse engineering or prototyping”

Tharun.T (19BEE054) - “From this course I came to know different applications/ Software’s that helps me to gain some knowledge”

Jayavarshini.V (19BFT020) - “Learning about new topics and learning to work as a team”

Harshini S V (19BEEE030) - “We could come to know all other innovative ideas which help us to design a good product”

Naveen Kumar. S (19MCA015) - “Watching videos and doing some interesting things for the subject”

Veeranan harish kumar (19BAE034) - “To know about the technology which is unknown”

Harshini S V (19BEEE030) - “We could come to know all other innovative ideas which help us to design a good product”

Deksha H - “It’s an opportunity to unearth and release a creative self being at home. It really made me think, and I liked how it enabled me to work along with crew”

Testimonials - Mentors

"Well planned and seamlessly integrated course covers fundamentals on rapid prototyping, design thinking, innovation and creativity. I congratulate the Forge Team for their untiring efforts in course design, implementation and handholding students through the course"

Dr B.Senthilkumar, Associate Professor, Mechanical Engineering, KCT

"The videos are well chosen with ample play time. These videos really kindle the design thinking of the audience. The videos produced by Forge personnel is professional"

Dr Dhanabal L, Assistant Professor, Master of Computer Application, KCT

"A nice journey to travel with an interdisciplinary team in an organized way. Student participation was also good. It would be very good if everything is offline. I would like to be involved in all the student innovations"

Shenbagam P, Assistant Professor, Information Technology, KCT

"It is a new experience with different branches, and they are happy to work with other department students as a Team"

Dr.R.Venkatesan, Professor, Mechatronics Engineering, KCT

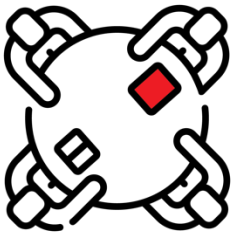
"The course videos were brief, informative and self-explanatory. This enabled our students to understand the topics easily and also get to know new things. The Assignment Questions were very good, and the concept of Peer Evaluation helped us to understand the involvement of team members."

Dr. S Rajani, Associate Professor, Computer Science Engineering, KCT

Recommendations and Suggestions

Recommendation and Suggestions	
Teamforge	**General Feedback for both the modules:** Context setting and the relevance to their educational background would help them to relate the concepts better More number of real-time case studies can be included to grasp the design concepts Transcripts for the videos to be included as some of the students find it challenging to go with the pace of the speakers. Lengthy Videos in Rapid Prototyping. **Module 1:** History and Modernism: The evolution of the design component could have been included as the part of the module Voice over could have been included in the video - "Design Thinking Animation", for conceptualization Most of the Voice over is from open source. They vary from different speeds. It can be avoided **Module 3:** Examples of case studies related to the assignments (APP design or Information Architecture) and more examples on Wireframes could have been included An explicit video that talks about the importance of design and its various stages involved could have been added
Educators	**General Feedback for both the modules:** Some best practices, tools and activities can be taught, instead of completely making it a set of explanatory videos of what is design and classifications etc. Team activities can be conducted for user understanding, design brainstorming etc. (Other than assignments) **Module 1:** The content flow the videos of the module is a losing interest More number of open-source videos **Module 2:**

	Activities related to reverse engineering can be incorporated **Module 3:** Some of the videos are brief for the students to understand, and the real-time examples can be given for them to relate the concepts **Module 4:** Need to have more practical content rather than having a theoretical one. Some of the rapid prototyping software's need hands-on to understand and implement the concepts
Students	**General Feedback for both the modules:** Some of the concepts explained are short for certain students to understand. More explanatory and case study can be incorporated A description video for the assignment can be given to solve the assignments Some of the videos were of high quality that was taking time to buffer Native language support can be incorporated More focus on activity based learning **Module 1:** The context of the video "Bauhaus: Design in a Nutshell" is not clearly defined. Some explanatory videos can be given that talk about "How to develop or to identify a Good Design and its need ?" Opportunities for the Product Design Engineer could have been included Explanations related to the assignments or some videos or guidelines of for the assignments could have been given **Module 2:** Complex examples can be illustrated for better understanding More examples can be included **Module 3:** Multiple concepts explained in some of the videos. Could have been split into multiple videos Need more real-time examples or case study needed for the UIUX design concepts **Module 4:** Some of the software needs a deeper understanding of the implementation. Some of the long videos can be split into smaller parts Need more practical assignments



Program Partners

FORGE
Your Innovation & Growth Partner

Forge as a partner incubator empowers **Government, Industry,** and **Academia** to exploit strategic opportunities through Innovation powered by deep-technologies such as artificial intelligence, data science, robotics, power electronics, augmented reality/virtual reality, and IoT. By combining frontier Technology and future-ready Talent, we help our Partners drive operational excellence outcomes and achieve business growth goals, through collaboration and co-creation with startups at speed and scale via a managed innovation framework.

In recent years, though we see the Indian startup ecosystem thriving, the indigenous engineering talent adept at exploiting & harnessing futuristic technologies have predominantly been focused on building replicas of consumer-internet products of the modern Silicon Valley owing to the high rate of investment flow in the space. Forge intends to bring a change and shift the focus towards industrial deep-tech startups which hold the key to solving India's toughest challenges in areas like manufacturing, transportation, urban infrastructure, healthcare, agriculture, water management, and various other issues impeding the economic and social development of the nation.

Forge as a **catalyst** for this process of Entrepreneurship, helps innovators and founders acquire and develop the resources and capacity to transform their innovative ideas into high-growth enterprises. The pivotal role played by the skills and competencies of these protagonists in key functional areas covering technology, innovation, business strategy and development, financial planning, operations, etc. can never be overestimated. And equally critical is the need for a structured and systematic approach to offering the necessary training, mentoring, and financing support to these visionaries.

Over the past few years, Forge has been recognised as the Partner Incubator for **iDEX by Min. of Defence**, nominated as the principal nodal centre for anchoring the **Smart India Hardware Hackathon by MHRD & AICTE**, approved by **AICTE to offer a unique 2-year MBA in Innovation, Entrepreneurship, and Venture Developmen**t. As the Strategic

Incubation Partner for Corporate Open Innovation programs, Forge has engaged with **Bosch for its Accelerator program**, managed the execution of the **Schneider Innovation** Grand Challenge, and is in the process of implementing a similar innovation challenge for **AstraZeneca**. Forge enables its Corporate Partners to derive Enterprise Value and achieve Strategic outcomes in the areas of Operational Capabilities, Commercial Partnerships and rapid inorganic growth via Strategic Investments.
Forge is recognised as the Strategic Partner for Vedanta Spark, a global innovation challenge and corporate accelerator program launched by Vedanta Limited, the global energy and resources conglomerate. Through the program, Forge aims to facilitate the identification and exploitation of opportunities for digitization across the value chain through collaboration with Indian & Global startups via Innovation & Venture partnerships. Forge is in conversation with many other large Industry Partners for their Corporate Acceleration Programs leading to creation of strategic assets and organisational enrichment.

Recently, Forge has been recognised as one of the 4 partner incubators to execute **SASACT** (Scheme for Accelerating Startups Around Post COVID Technology Opportunities) launched by MeitY, Government of India to fund Industrial Digital Technology startups with products responding to the post-COVID era with a corpus of 2.5 Cr. Forge is also a recognised **PRAYAS** centre and certified partner for **TIDE 2.0**, an initiative by **MeitY Startup Hub**.

Most significantly, Forge has been nominated as the **Partner Incubator by SIPCOT, a Govt. of Tamil Nadu** undertaking under the aegis of the Industries Department, for the establishment of Industrial Innovation Centres in each of the SIPCOT Industrial SEZs. The initiative is aimed at unlocking the massive potential for socio-economic growth by combining TN's strengths in manufacturing excellence with technology leadership attained through catalyzing innovation, venture capital, and entrepreneurship among its highly talented youth. To begin with, two **SIPCOT Industrial Innovation Centres** (SIICs) shall be set up in the top manufacturing clusters in Tamil Nadu - Chennai and Hosur, and these Deep-Tech Incubators are expected to be fully operational by January 2021.

Since its inception, Forge has played a dominant role in incubating startups and prototyping innovations totalling to 134 in number currently at different stages of innovation, acceleration, and investment. Through our unique Student **Innovation Fellowship program** alone, 200+ Innovation Engineers have graduated, creating 50+ deployment-ready industrial product innovations, which are validated, tested, and co-created with sponsor MSME and Corporate industrial companies. Over Rs.1.5 Crores in the form of rewards, grants, and revenues have been won, further validating the

enormously untapped capacity for innovation within students. Forge as the Partner Incubator is on a mission to build a **national-scale ecosystem** bringing together Government, Industry, and Academia to foster industrial open innovation.

Visit us at: http://www.forgeforward.in/

Established in September 2015, Spread is India's youngest and fastest-growing design company. Its co-founders Sonia Manchanda, Girish Raj Nair, Mohammad Javed have over 30 years of experience in Design / Advertising in companies like J. Walter Thompson, McCann Erickson and DDB Needham, besides setting the foundation for one of India's largest Design Practices, IDIOM Design and Consulting.

Spread is a multidisciplinary, strategic design practice working across geographies spanning India, Sri Lanka, the Middle East, Brazil, United Kingdom, and Malaysia. Design Sense (spread's method) is rooted in its DNA, which blends design thinking and strategy, to create Omnichannel Experience Design and Learning Experience Design.

Spread has worked as the Design and communication partner with National and State Governments in India. Working on large scale projects with the Ministry of Road Transport/ Highways, Agriculture Ministry, Rural Development Ministry, ITBT Ministry). Bringing behaviour change in rural Karnataka around waste, water and sanitation.

Being the Design Agency for large scale national/ international events like Commonwealth Games 2010, India Integrated Transport and Logistics Summit, Bangalore Forward, Bangalore IT Biz, Pravasi Bharatiya Divas 2017. Designing over 10 million sq. ft of retail experience spaces by building brands and stores for India's largest retailer, Future Group. Engaging in Design Training for companies like Honeywell, Daimler Benz, MuSigma, Hexaware, Accenture, YPO, Manipal Group. Designing Training Education content for various Institutions like Manipal Education, Wadhwani Foundation, and Forge incubator.

Spread is unique as it integrates Strategy, Design, Technology, and New media. By creating strategies, brands, businesses, films, and AR VR experiences, digital platforms, retail experiences, print & digital communication, learning models, curriculum and content, learning experiences and much more. Spread believes that Design is the way to incubate the future, impact society and innovate every day.

Visit us at: www.spread.ooo

Annexures

- Mentor List
- Assignment Questions
- Assignment Key
- Quiz/MCQ
- Quiz/Polls for Mentor Hours
- Reading Materials
- Peer Evaluation
- Feedback and Suggestion Questionnaire
- Mentor Assessment Sheet

Mentor List

Mentor List for Design Sprint - Cycle 2

#	Name of Faculty	Department	Mail ID
Cohort 1			
1	Ariharasudhan.S	TT	ariharasudhan.s.txt@kct.ac.in
2	Boopathy.S	ECE	boopathy.s.ece@kct.ac.in
3	Darwin.R	ECE	darwin.r.ece@kct.ac.in
4	Manikandaprasath.K	MEC	manikandaprasath.k.mec@kct.ac.in
5	Nithyaroopa.s	CSE	nithyaroopa.s.cse@kct.ac.in
6	Senthilkumar.B	MEC	senthilkumar.b.mec@kct.ac.in
7	Syedalifathima.SJ	CSE	syedalifathima.sj.cse@kct.ac.in
Cohort 2			
8	Allinjoe.D	ECE	allinjoe.d.ece@kct.ac.in
9	Jamuna.M	CIVIL	jamuna.m.ce@kct.ac.in
10	Karthika K	ECE	karthika.k.ece@kct.ac.in
11	Manivelmuralidaran. V	MCE	manivelmuralidaran.v.mec@kct.ac.in
12	Natarajan S	TXT	natarajan.s.txt@kct.ac.in
13	Senthilkumar.V	CSE	senthilkumar.v.cse@kct.ac.in
14	Sindhuvaardini.U	CIVIL	sindhuvaardini.u.ce@kct.ac.in
15	Suresh.S	MEC	suresh.s.mec@kct.ac.in

16	Umamaheswari.S	CSE	umamaheswari.s.cse@kct.ac.in
Cohort 3			
17	David.S	ECE	david.s.ece@kct.ac.in
18	Manju R	CIVIL	manju.r.ce@kct.ac.in
19	Muruganantham.VR	MEC	muruganantham.vr.mec@kct.ac.in
20	Pradeep.P	MEC	pradeep.p.mec@kct.ac.in
21	Timothy	ECE	timothy.ece@kct.ac.in
22	Vishnu.a	CIVIL	vishnu.a.ce@kct.ac.in

Mentor List for Design Sprint - Cycle 3

#	Name of Faculty	Department	Mail ID
Cohort 1			
1	R.Vijayanandh	AERO	vijayanandh.r.aeu@kct.ac.in
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3	Balaji V R	EEE	balaji.vr.eee@kct.ac.in
4	Suryaprakash.S	EEE	suryaprakash.s.eee@kct.ac.in
5	Dr D.Chandrakala	ISE	chandrakala.d.cse@kct.ac.in
6	Dr S.Rajini	CSE	rajini.s.cse@kct.ac.in
7	V. Veerabhuvaneshwari	BIO	veerabhuvaneshwari.v.bt@kct.ac.in
Cohort 2			
8	Dr.S.John Alexis	AUTO	johnalexis.s.auto@kct.ac.in
9	Mr.R.Kishore	AUTO	kishore.r.auto@kct.ac.in

10	Vinothkumar. N	EEE	vinothkumar.n.eee@kct.ac.in
11	Anushree.G	EEE	anushree.g.eee@kct.ac.in
12	Mr.S.Kanagaraj	IT	kanagaraj.s.it@kct.ac.in
13	Ms.P.Shenbagam	IT	shenbagam.p.it@kct.ac.in
Cohort 3			
14	P. Magudapathi	MCE	magudapathi.p.mce@kct.ac.in
15	Dr. R. Venkatesan	MCE	venkatesan.r.mce@kct.ac.in
16	M. SaravanaBalaji	EIE	saravanabalaji.m.eie@kct.ac.in
17	V. Manimekalai	EIE	manimekalai.v.eie@kct.ac.in
18	Dr.L.Dhanabal	MCA	dhanabal.l.mca@kct.ac.in

Assignment Questions

Module 1 - Design as a Language

S.No	Assignment Questions	Template
1	Design a study table handy for your friend using the design process	Template for Assignment 1
2	Express and distinguish 4 human emotions: laughter, sorrow, love, anger. Create compositions with basic design elements to express each emotion implementing and experimenting with the principles of design. 1. space/line 3. shape 4. colour 5. texture	Template for Assignment 2
3	Identify 5 products/services that depict good design and tell us why?	Template for Assignment 3
4	List out, Draw & explain 5 examples of product & service each. NOTE: Some solutions might qualify for product and service both. However, they have to be explained with details in the right context.	Template for Assignment 4

Module 2 - System Thinking and Reverse Engineering

1. Considering making toast (toasted bread) as a system, can you map the entities involved, their relationships, and how the emergent function comes about? Upload the drawing as a .jpg or .png file format
2. For the Human Circulatory System perform the 4 System thinking tasks and submit the answers in the given slide deck template
3. The human circulatory system draws a causal loop diagram with at least 3 feedback loops and submits the image in .jpg or .png file formats.

Module 3 - User Interface & User Experience

S.No	Assignment Questions	Template
1	Make a list of your top ten apps and why do you like them. Draw out your favourite screen for each app on an A4 Sheet. Provide 5 reasons for each App that do not overlap with each other overall.	Template for Assignment 1
2	Explore 5 research techniques apart from the ones mentioned. Please elaborate on Why & Where are they used.	Template for Assignment 2
3	Plan a project & UX Workflow for your project & detail out each step	Template for Assignment 3
4	Information Architecture: Design the information architecture of your dream college / University	Template for Assignment 4
5	Paper prototyping: Draw a sequenced screen for one end to end functionality for any application.	Template for Assignment 5
6	Create Wireframes	Template for Assignment 6

Module 4 - Rapid Prototyping

S.No	Assignments (Teams Having Laptops/Computers)	Assignments (Teams without Laptops/computers)
1	Download a CAD Model from Thingiverse and perform slicing operation using Slicer. Screenshot the entire window with the sliced model preview and data showing estimated print time and material usage. Add your name and roll number on the screenshot using an image editing tool and submit the .gcode and as well as the screenshot in .jpg/.png file formats	(A) Download a CAD Model from Thingiverse and perform slicing operation using Slicer. Capture the steps involved in generating machine-readable G-Code. (B) Upload a picture of the selected CAD model and rationalize which orientation would be optimum for printing.
2	Design a simple ID card, take college ID Dimensions and perform Cut, Scan operation so the ID card can be manufactured using MDF material using a laser cutter. You can skip your profile picture if you want to (optional) file but	(A) Design a simple ID card (In paper or digitally), take college ID Dimensions and mark the area with respective operations to be done, so the ID card can be

	include College Logo, Name, Roll Number, Department	manufactured using MDF material using a laser cutter. The ID card layout must have Candidate photo (optional), College Logo, Name, Roll Number, Department. (B) Deduce a flow that should be followed after designing done in the previous process.
3	Develop a circuit without microcontrollers for speed control of 6V DC motor with a simple transistor driver to drive the DC motor and protection circuit to avoid reverse current from the motor. Follow the 6 steps involved in electronics prototyping and add the screenshots of the same as .jpg/.png file formats. Add your name and roll number in the Silk layer. The size of the board should be within 100mm x 30mm and Single-sided PCB.	Develop a circuit without microcontrollers for speed control of 6V DC motor using a simple transistor driver circuit to drive the DC motor and protection circuit to avoid reverse current from the motor. Answer the following questions. a. Block diagram of the circuit b. Component selection for the circuit c. Building the circuit d. List the steps involved in designing a Printed Circuit Board
4	Clone the designs print demo application, make changes to the home.html file, create a GitHub account and upload the files. Enable Github Actions and deploy your application onto Heroku. Submit the screenshot of the GitHub repo with your profile, GitHub action status, Final application view in the browser as .jpg/.png file (Total of 3 screenshots)	Draw a flowchart illustrating the process to clone the designs print demo application, make changes to the home.html file, create a GitHub account and upload the files. Enable Github Actions and deploy your application on Heroku.

Assignment Key

Answer key Module 1 - Design Fundamentals

1. Assignment 1 - Design a study table handy for your friend using the design process (20 Marks)

Answer Key:

- Template for Assignment 1

Evaluation Metrics:

Metrics	Excellent	Average	Low
List of stages 1. Empathize 2. Define 3. Ideate 4. Prototype 5. Test	List of all 5 stages correctly and also in sequence - **5 Marks**	List of 3 or 4 stages correctly and also in sequence - **3 Marks**	List of 2 or fewer stages correctly and also in sequence - **2 Marks**
Explanation of relevant activities	Well detailed explanation - **15 Marks**	Listed most of the details in the explanation - **10 Marks**	Listed only a few explanations - **5 Marks**

2. Assignment 2 - Express and distinguish 4 human emotions: laughter, sorrow, love, anger. Create compositions with basic design elements to express each emotion implementing and experimenting with the principles of design. (20 Marks)

1. space/line
3. shape
4. colour
5. texture

Answer Key:

- Template for Assignment 2

Evaluation Metrics:

Metrics	Excellent	Average	Low
Express 4 human emotions	Expressed all 4 emotions - **20 Marks**	Expressed 2 orl 3 emotions - **15 Marks**	Expressed 1 or 2 emotions - **10 Marks**

4. Assignment 3 - Identify 5 products/services that depict good design and tell us why? (20 Marks)

Answer Key:

- Template for Assignment 3

Evaluation Metrics:

Metrics	Excellent	Average	Low
List of 5 products/services	List of 5 products/services - **5 Marks**	List of 3 or 4 products/services - **3 Marks**	List of 2 or less products/services - **2 Marks**
Explanation for good design	Well detailed explanation - **15 Marks**	Listed most of the details in the explanation - **10 Marks**	Listed only a few explanations - **5 Marks**

4. Assignment 4 - List out, Draw & explain 5 examples of product & service each. (20 Marks)

NOTE: Some solutions might qualify for product and service both. However, they have to be explained with details in the right context.

Answer Key:

- Template for Assignment 4

Evaluation Metrics:

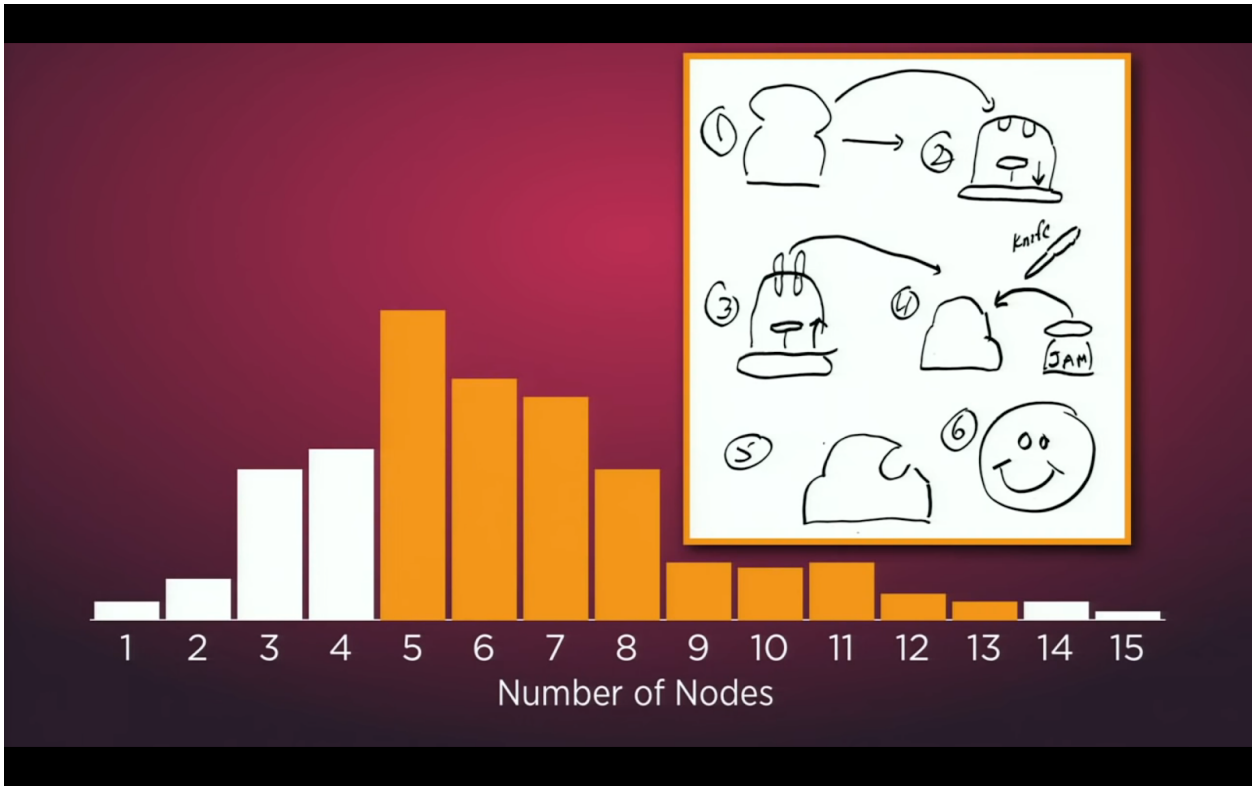
Metrics	Excellent	Average	Low
List of 5 products/services	List of 5 products/services - **5 Marks**	List of 3 or 4 products/services - **3 Marks**	List of 2 or less products/services - **2 Marks**

Explanation and list of problem it solves	Well detailed explanation - **15 Marks**	Listed most of the details in the explanation - **10 Marks**	Listed only a few explanations - **5 Marks**

Answer key Module 2 - System Thinking and Reverse Engineering

1. Considering making toast (toasted bread) as a system, can you map the entities involved, their relationships, and how the emergent function comes about? Upload the drawing as a .jpg or .png file format (20 Marks)

Answer Key:
Watch this video before evaluating the assignments: Link



Evaluation Metrics:

1. If the number of nodes is between 5 to 13 grant full marks (**20 Marks**)
2. If it is less than 5 nodes grant 10 and greater than 13 nodes grant (**15 Marks**)

2. For the Human Circulatory System perform the 4 System thinking tasks and submit the answers in the given slide deck template. (20 Marks)

Answer Key:

- The students need to submit the answer in the given PPT format *(Which was send across)*

Task1

Identify the System
Its Form, Its Function

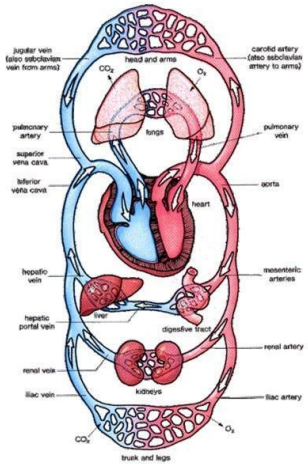
System	Form	Function	
Human Circulatory System	The Human Cirulatory System	Supplies	Oxygen

Zooming > < Emergence Aggregation > < Decomposition

System Function	Entity Function	Entity Form	System Form
Supplies Oxygen to Organs	Pumps Blood	Heart	The Circulatory System
	Exchanges gases with atmosphere	Lungs	
	Exchanges gases with organs	Capillaries	

Task2

Identify
the entities of the System
Their Form, their Function

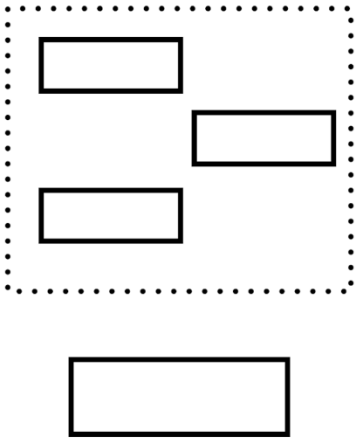


Task3

Identify the relationships among the entities

Circulatory System

Relationship diagram
(list entities and relationships)



N Squared Diagram
(list entities and relationships)

Formal Relationship			

Functional Relationship			

Evaluation Metrics:

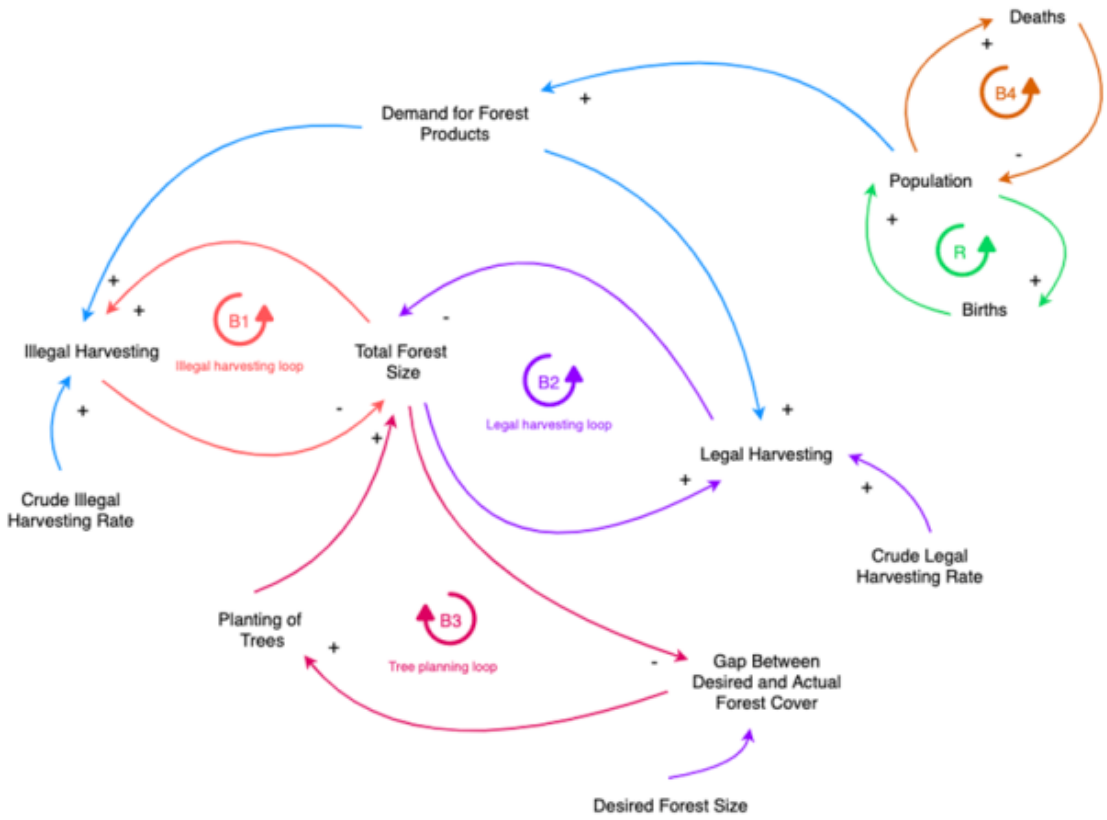
1. Grant full marks (**20 Marks**) if there are 3 entity functions, entity form, and proper reasoning to Task 4
2. Grant **15 marks** if there are less than 4 formal relationship and functional relationship
3. Grant **10 marks** if there are a vague relationship and irrelevant function and form

3. For the human circulatory system draws a causal loop diagram with at least 3 feedback loops and submits the image in .jpg or .png file formats. (20 Marks)

Answer Key:

- Develop the causal loop diagram using this tool: Link
- Kindly watch this tutorial to use the online tool: Link

Sample Submission:



Evaluation Metrics:

1. Grant **20 marks** if there are 4 loops eg: B1, B2, B3, B4 and a minimum of 13 links
2. Grant **15 marks** if the total number of links is less than 13
3. Grant **10 marks** if there are less than 3 loops and 10 links

Answer key Module 3 - User Interface & User Experience

1. Assignment 1 - Make a list of your top ten apps and why do you like them. Provide 5 reasons for each App that do not overlap with each other overall. (20 Marks)

Answer Key:

- Template for Assignment 1

Evaluation Metrics:

Metrics	Excellent	Average	Low
Listing of Apps	No of apps listed is 10 then grant - **5 Marks**	No of apps listed between 7-9, grant **3 Marks**	No of apps listed is less than 7, then grant **2 Marks**
Reasons which are not repeated	Listed all reasons for 10 apps - **15 Marks**	Listed reasons for 7-9 apps - **10 Marks**	Listed reasons for less than 7 apps - **5 Marks**

2. Assignment 2 - Explore 5 research techniques apart from the ones mentioned. Please elaborate on Why & Where are they used. (20 Marks)

Answer Key:

- Template for Assignment 2

Evaluation Metrics:

Metrics	Excellent	Average	Low
List of 5 techniques apart from techniques explained in the video	List of 5 new techniques - **5 Marks**	List of 3 or 4 new techniques - **3 Marks**	List of 2 or less new techniques - **2 Marks**
Explanation	Well detailed explanation - **15 Marks**	Listed most of the details in the explanation - **10 Marks**	Listed only a few explanations - **5 Marks**

3. Assignment 3 - Plan a project & UX Workflow for your project & detail out each step (20 Marks)

Answer Key:

- Template for Assignment 3

Evaluation Metrics:

Metrics	Excellent	Average	Low
List of all stages	List of all 5 stages correctly and also in sequence - **5 Marks**	List of 3 or 4 stages correctly and also in sequence - **3 Marks**	List of 2 or fewer stages correctly and also in sequence - **2 Marks**
Explanation of Outcomes	Well detailed Outcomes - **15 Marks**	Listed most of the details in the Outcomes - **10 Marks**	Listed only a few Outcomes - **5 Marks**

4. Assignment 4 - Information Architecture: Design the information architecture of your dream college / University (20 Marks)

Answer Key:

- Template for Assignment 4

Evaluation Metrics:

Metrics	Excellent	Average	Low
Architecture of dream College / University	Well detailed Architecture is shown - **20 Marks**	Listed most of the features in the Architecture - **15 Marks**	Listed only a few features in the Architecture - **10 Marks**

5. Assignment 5 - Paper prototyping: Draw a sequenced screen for one end to end functionality for any application. (10 Marks)

Answer Key:

- Template for Assignment 5

Evaluation Metrics:

Metrics	Excellent	Average	Low

The sequence of functionality for any application.	Well detailed sequence is shown - **10 Marks**	Listed most of the functionalities to the application - **7 Marks**	Listed only a few functionalities - **5 Marks**

6. Assignment 6 - Create wireframes for a mobile application for your college website. Depict at least one end to end functionality via these wireframes. (10 Marks)

Answer Key:

- Template for Assignment 6

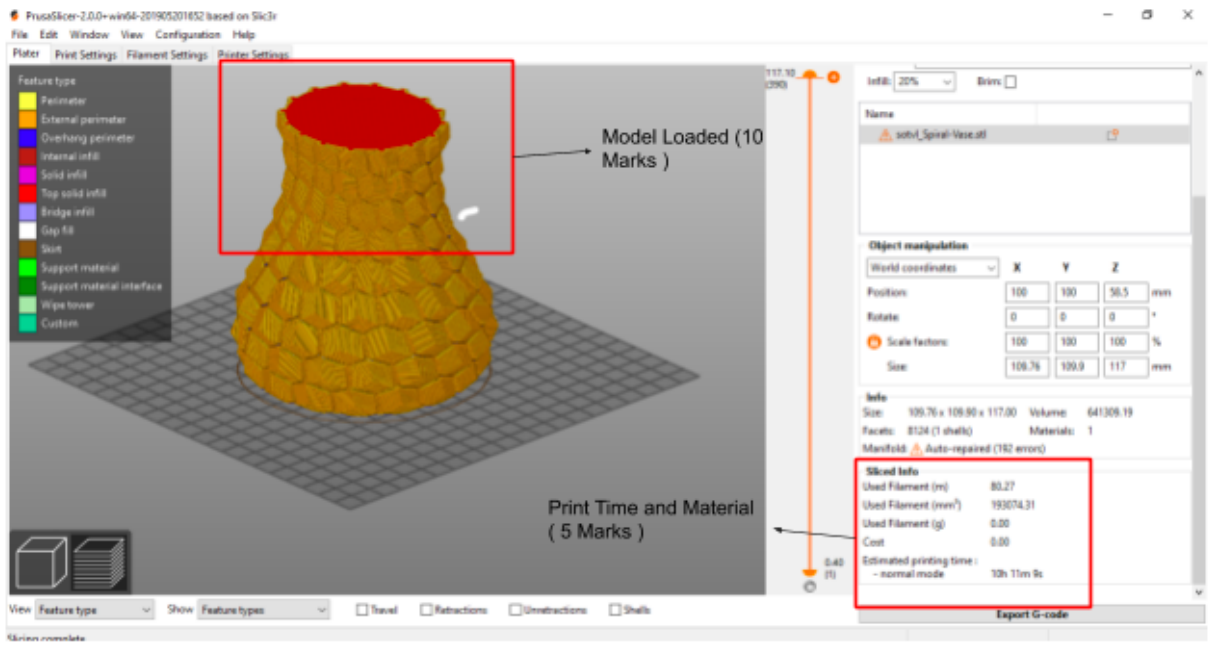
Evaluation Metrics:

Metrics	Excellent	Average	Low
Wireframes for a mobile application for KCT website	Well detailed Wireframes is shown - **10 Marks**	Listed most of the wireframes - **7 Marks**	Listed only a few Wireframes - **5 Marks**

Answer key Module 4 - Rapid Prototyping

The answer key for the Teams Having Laptops/Computers

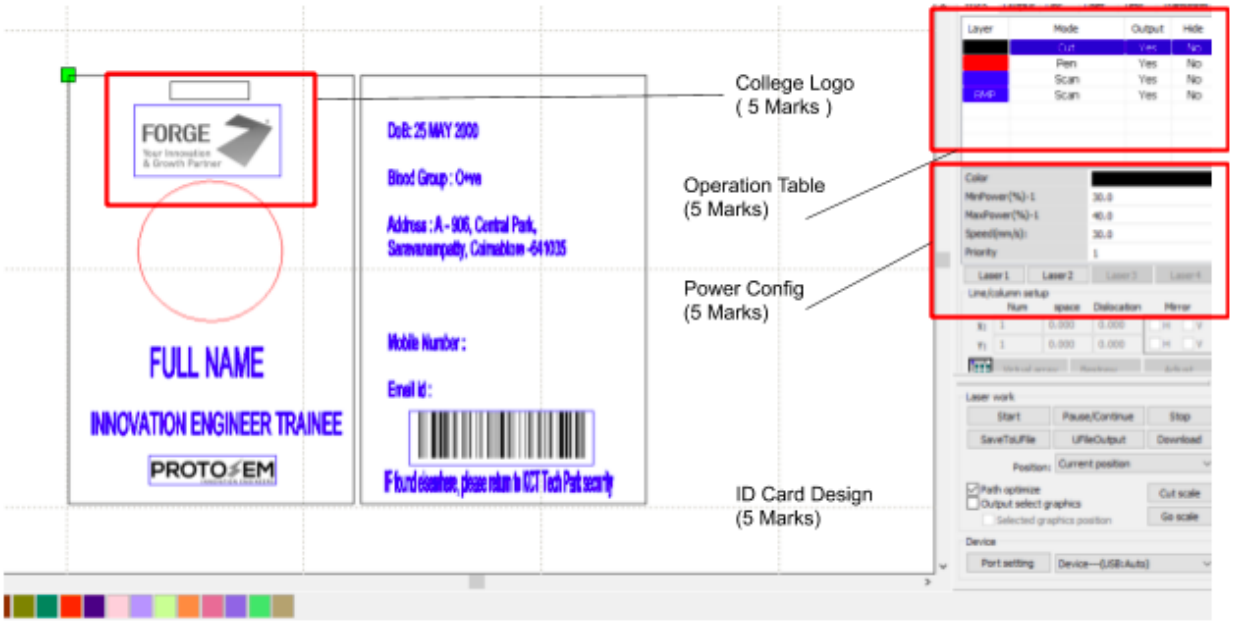
1. Download a CAD Model from Thingiverse and perform slicing operation using Slicer. Screenshot the entire window with the sliced model preview and data showing estimated print time and material usage. Add your name and roll number on the screenshot using an image editing tool and submit the .gcode and as well as the screenshot in .jpg/.png file formats (20 Marks)



Evaluation Metrics:

1. The model can be anything of the student choice, grant **10 marks** for the chosen model.
2. The print time estimation and used filament data will be shown only after completing all process correctly, hence grant **5 marks** if that data is visible.
3. Gcode file cannot be reviewed without software, It marks the final export operation and successful completion of the slicing process If uploaded grant **5 Marks**.

2. Design a simple ID card, take college ID Dimensions and perform Cut, Scan operation so the ID card can be manufactured using MDF material using a laser cutter. You can skip your profile picture if you want to (optional) file but include College Logo, Name, Roll Number, Department (20 Marks)



Evaluation Metrics:

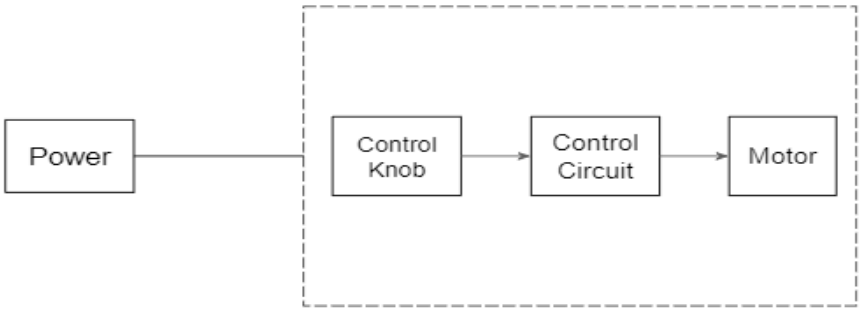
1. Grant **5 Marks** for creating an ID card design on the software
2. College logos or any logo can be uploaded onto the software. If an image is on the screenshot grant **5 marks**.
3. The operation table should have the works Cut and Scan, then grant **5 marks** if not grant 2 marks
4. The power config table should show numerical value and a priority, then grant **5 marks**, if not 2 marks

3.Develop a circuit without microcontrollers for speed control of 6V DC motor with a simple transistor driver to drive the DC motor and protection circuit to avoid reverse current from the motor. Follow the 6 steps involved in electronics prototyping and add the screenshots of the same as .jpg/.png file formats. Add your name and roll number in the Silk layer. The size of the board should be within 100mm x 30mm and Single-sided PCB. (20 Marks)

Evaluation Metrics:

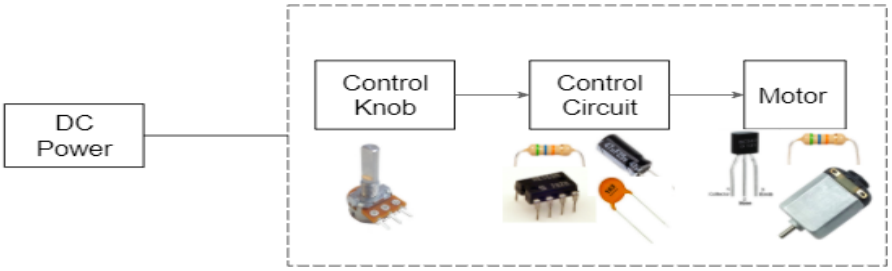
Step 1: Block diagram - 1 Mark

Block Diagram

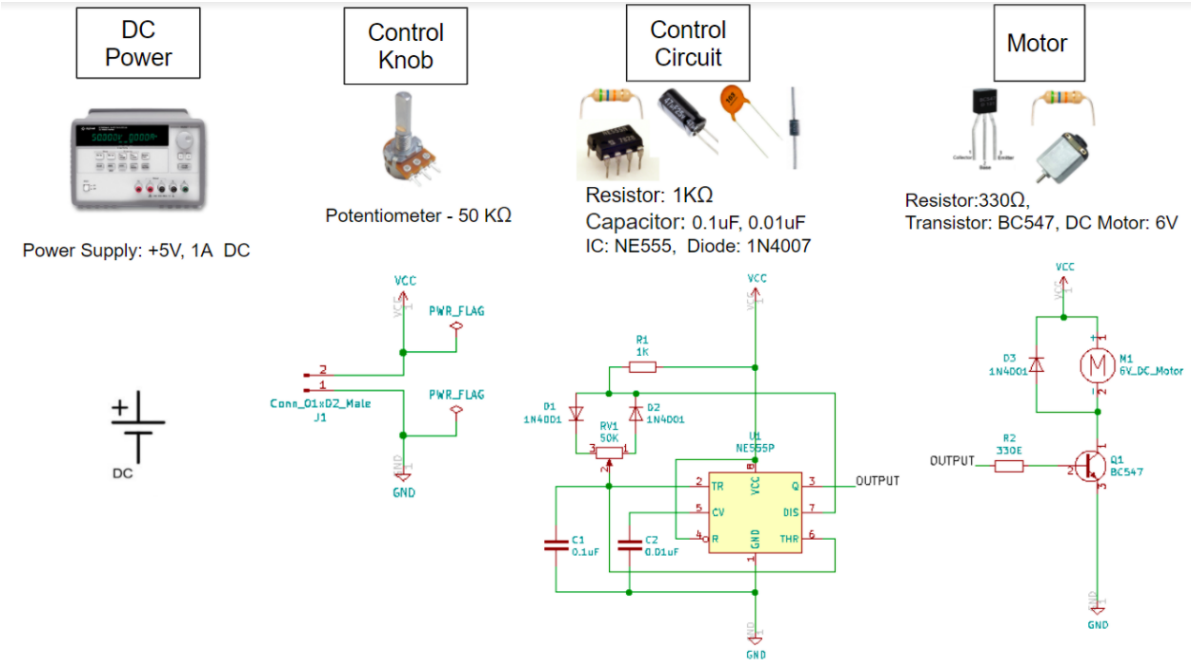


Step 2: Component Selection - 1 Mark

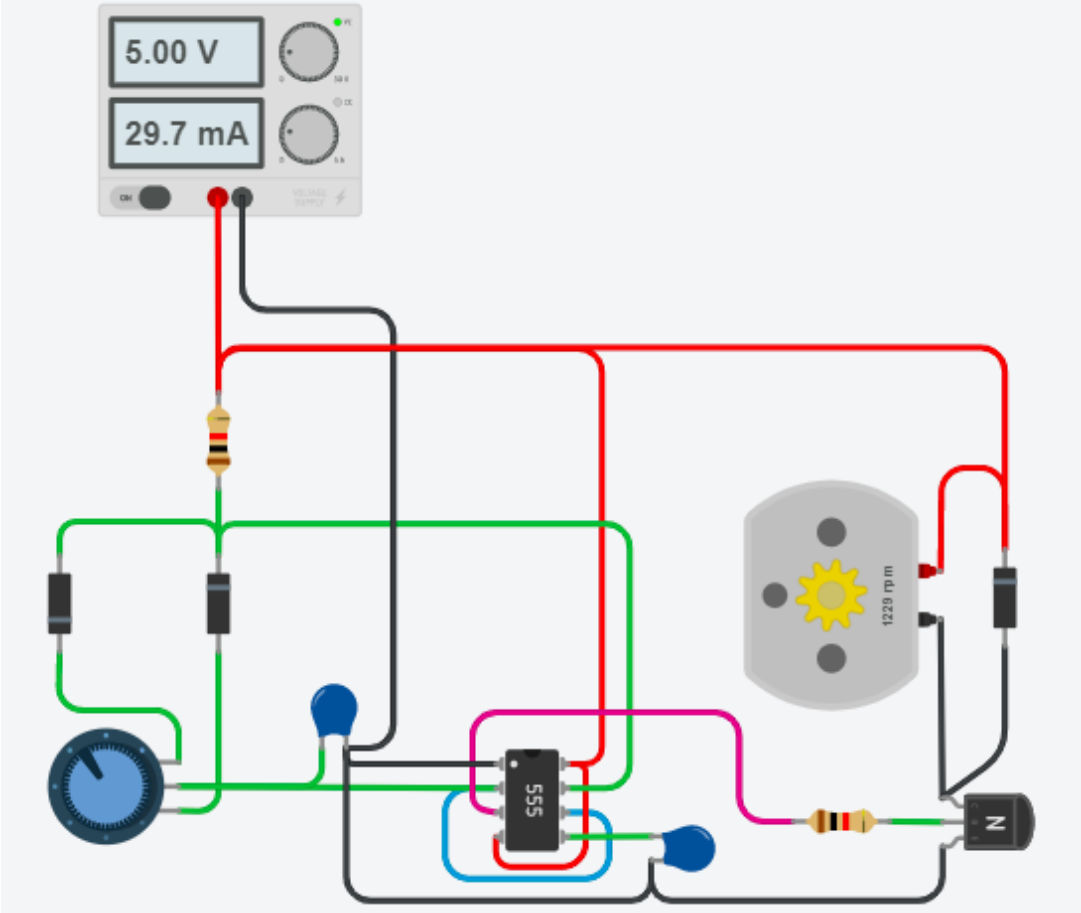
Component Selection



Step 3: Circuit Building - 4 Marks

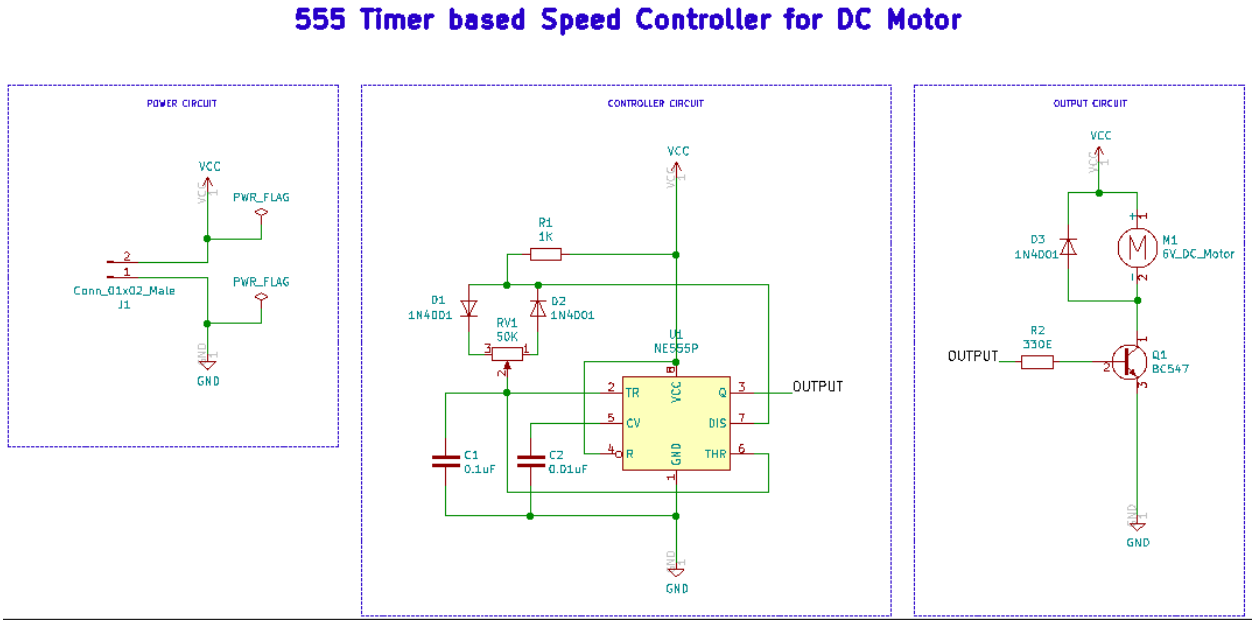


Step 4: Simulation - 3 Marks

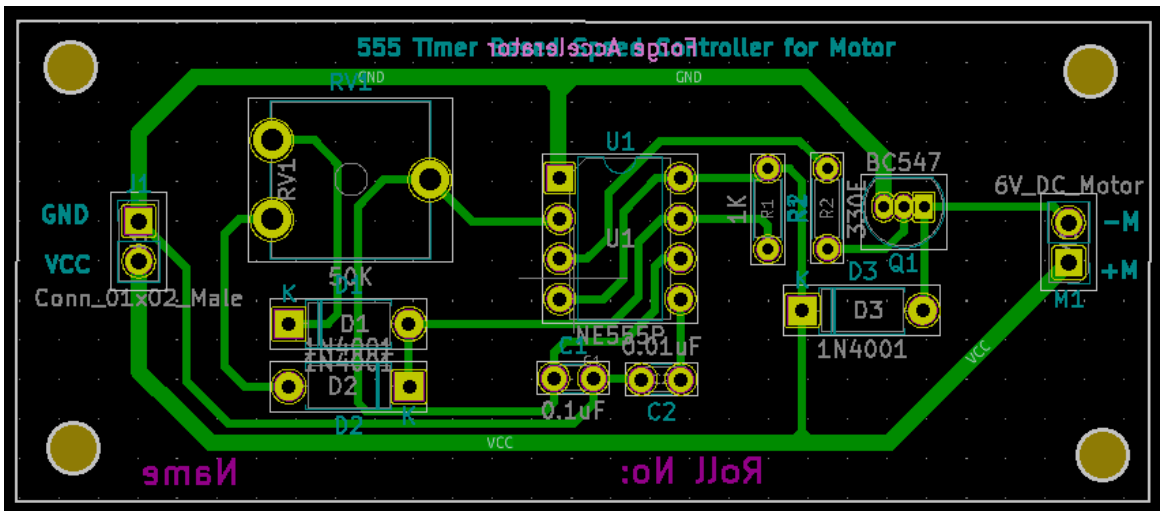


Step 5:

a) Creating Schematics - 5 Marks

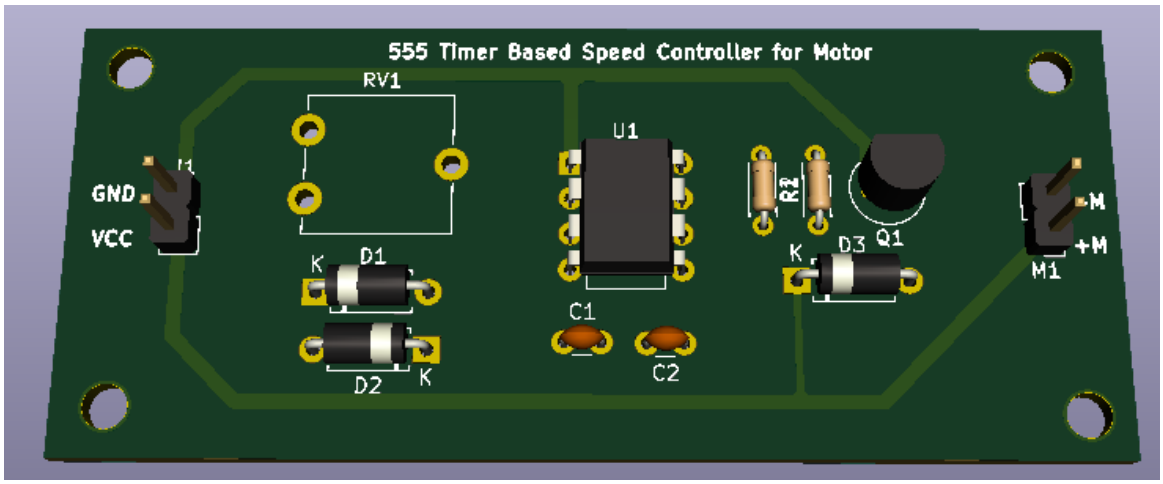


b) PCB layout creation - 5 Marks

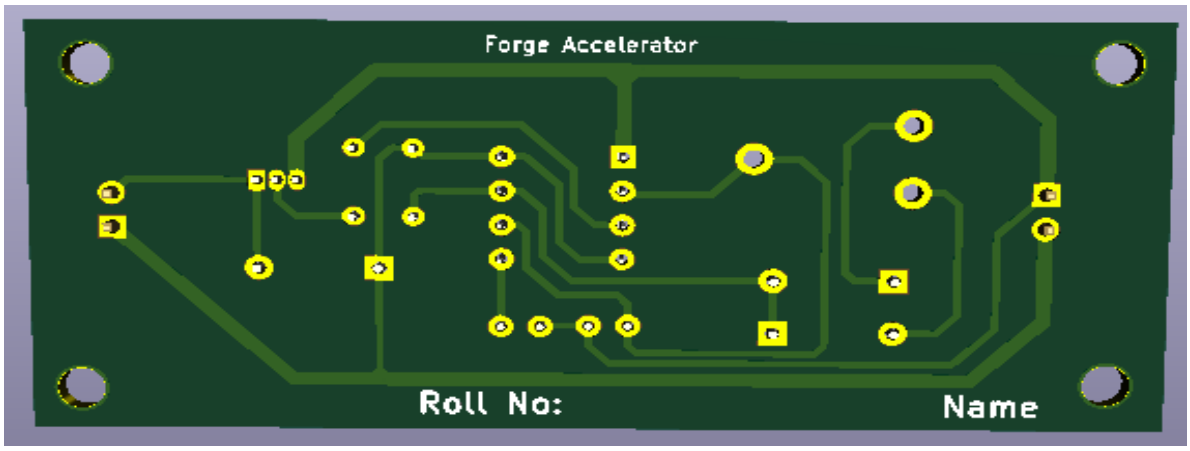


Step 6: 3D View - 1 Mark

a. Front View



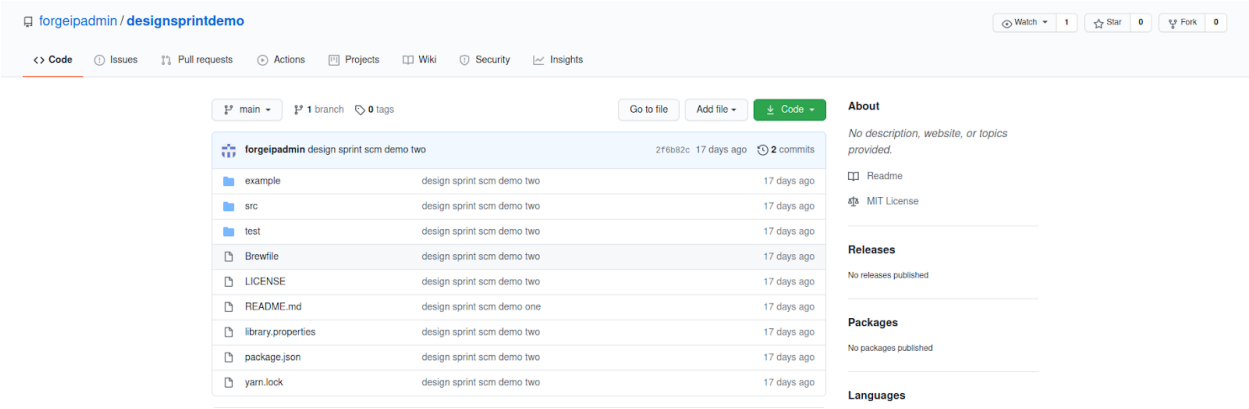
b. Back View



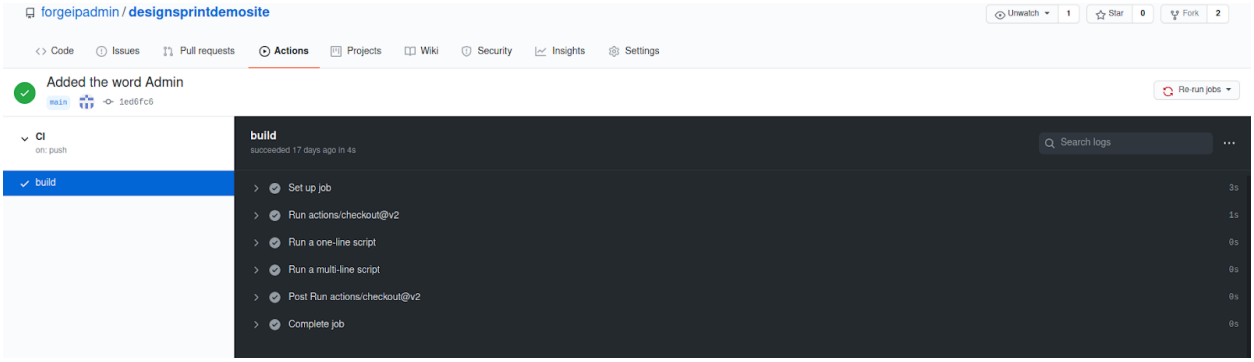
4. Clone the design sprint demo application, make changes to the home.html file, create a GitHub account and upload the files. Enable Github Actions and deploy your application onto Heroku. Submit the screenshot of the GitHub repo with your profile, GitHub action status, Final application view in the browser as .jpg/.png file (Total of 3 screenshots) (20 Marks)

Evaluation Metrics:

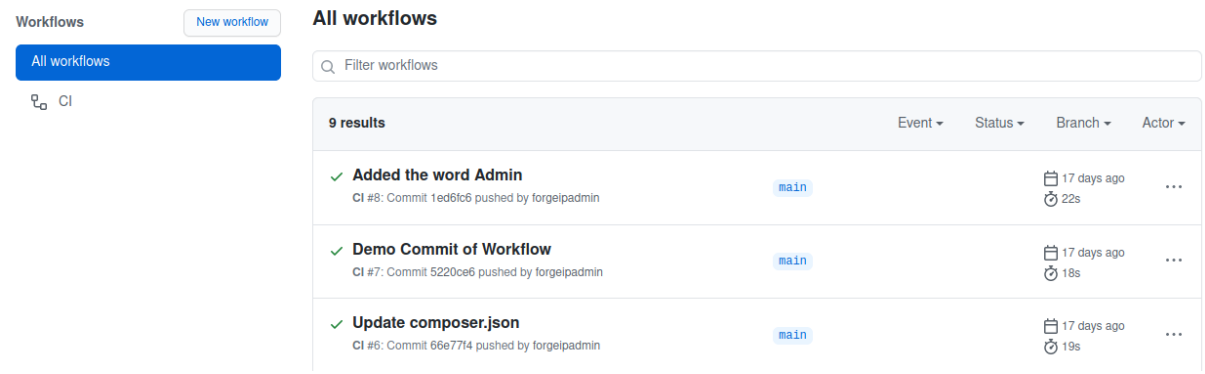
1. Git Hub Repo Screenshot (Should have student profile name) - **5 Marks**



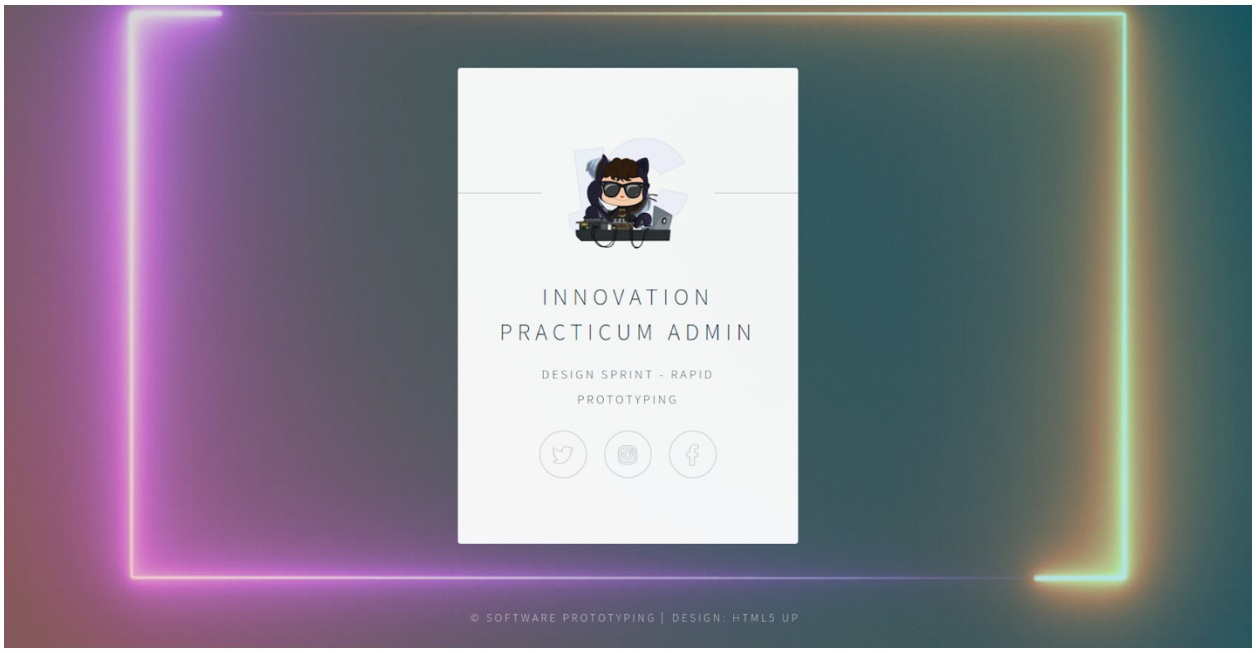
1. GitHub Action Status (Green Tick Must Have) - **5 Marks**



Or



1. Application Hosted with Student name Instead of INNOVATION PRACTICUM ADMIN - **10 marks**



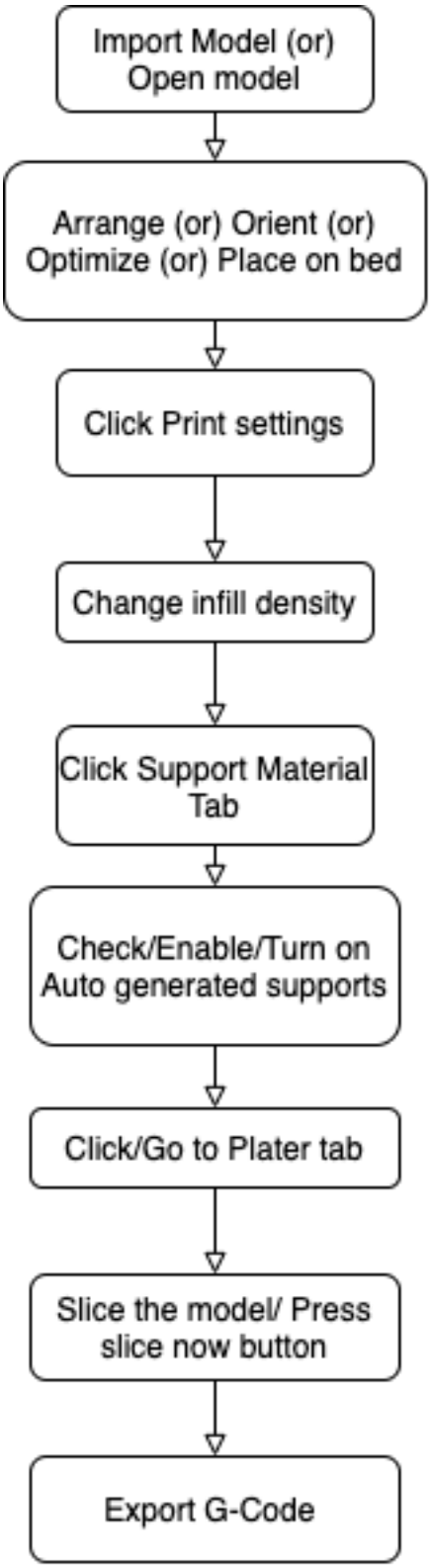
The answer key for the Teams without Laptops/computers

1. (A) Download a CAD Model from Thingiverse and perform slicing operation using Slicer. Capture the steps involved in generating machine-readable G-Code.
   (B) Upload a picture of the selected CAD model and rationalize which orientation would be optimum for printing. (20 Marks)

A. Process Flow Chart - 10 Marks

Answer key:

- *The number of steps is not restricted to the following sample diagram. Words used in the diagram or related words can be considered as keywords.*
- *The diagram can be either in landscape or portrait orientation.*



B. Description - 10 Marks

Answer key:

- *Check for an image of 3D Model - 5 Marks*
- *Description with any few of the following keywords - 5 marks*
    - *Orientation*
    - *Surface*
    - *Support*
    - *Support material*
    - *Angle*
    - *Bed*
    - *Base*
    - *Bottom plane*
    - *Rotate/rotation*
    - *Axis*
    - *Plane*
    - *Top plane*
    - *Left plane / Right plane*
    - *Front plane*

1. (A) Design a simple ID card (In paper or digitally), take college ID Dimensions and mark the area with respective operations to be done, so the ID card can be manufactured using MDF material using a laser cutter. The ID card layout must have Candidate photo (optional), College Logo, Name, Roll Number, Department.

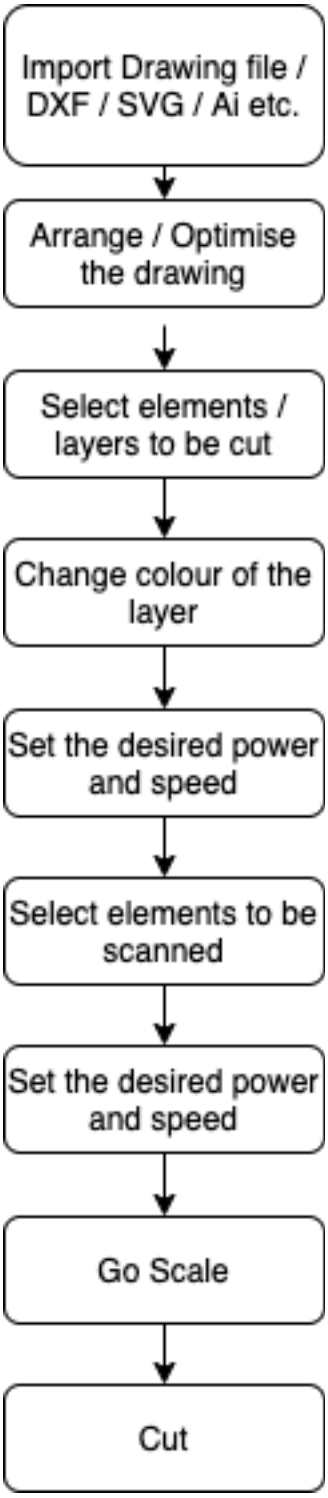
(B) Deduce a flow that should be followed after designing done in the previous process. (20 Marks)

Answer key:

- **A)** Check if there is an image similar to ID Card with the following as compulsory elements and they should be annotated with the respective operations: - **10 Marks**

Item	Annotations
1 Mark/item	**1 Mark/Annotation**
ID Card Outline	Cut
College logo	Scan (or) Etch
Name	Scan (or) Etch
Roll number	Scan (or) Etch
Department	Scan (or) Etch

- **B)** The following kind of flow chart not restricted to the same number of processes or boxes should be present - **4 marks**
- The words used in the flow process or related words to be present in the flow chart - **6 marks**
- The flowchart can be in portrait or landscape format.



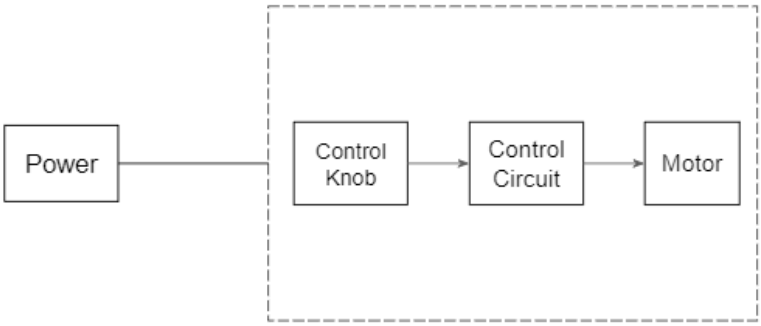
3. Develop a circuit without microcontrollers for speed control of 6V DC motor using a simple transistor driver circuit to drive DC motor and protection circuit to avoid reverse current from the motor. Answer the following questions.

a. Block diagram of the circuit
b. Component selection for the circuit
c. Building the circuit
d. List the steps involved in designing a Printed Circuit Board. (20 Marks)

Answer Key:

a. Block diagram - 1 Marks
b. Component selection - 2 Marks

Block Diagram



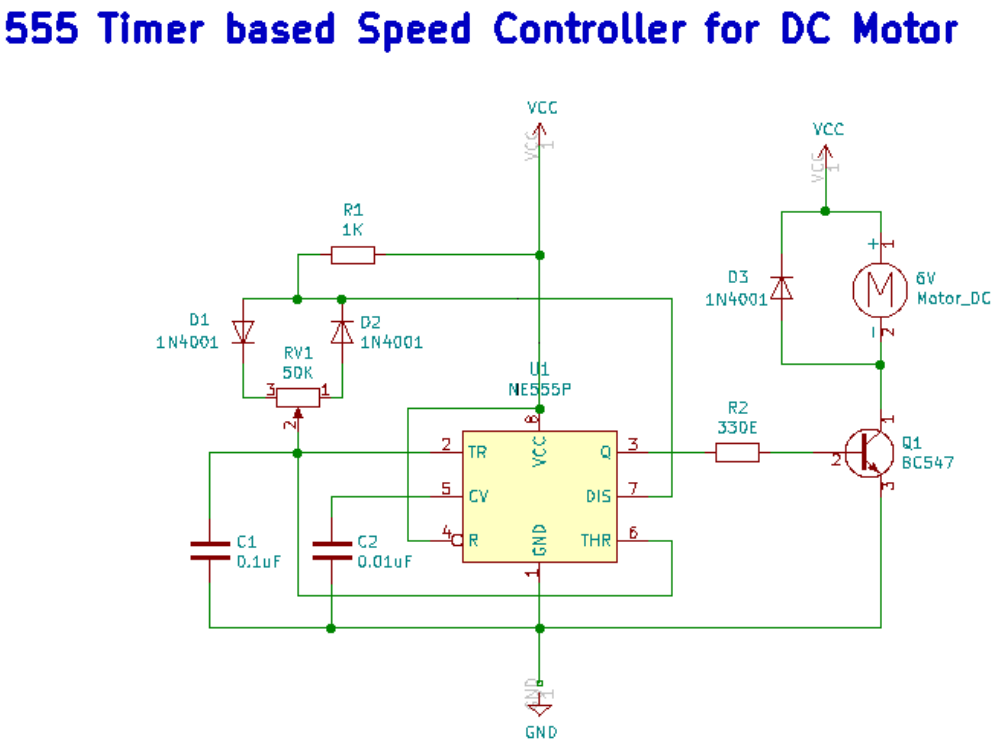
(The components value can differ based on the selection)

- IC - NE555 timer - To generate PWM pulses to control the speed of the motor
- Resistor - To limit the current and to set threshold voltage/frequency
- Potentiometer - To control duty cycles and vary the speed of the motor
- Capacitor - To set the frequency of the PWM signal
- Diodes - To protect the circuit from charging/discharging of circuit
- Transistor - To drive the DC motor
- DC motor - To act as the load to the circuit
- Power supply - To provide power to the circuits

c. **Building the circuit - 7 Marks**

(The circuit design can differ based on the calculations)

Circuit diagram for 555 Timer-based speed controller for DC motor



d. **Steps involved in designing a Printed Circuit Board - 10 Marks**

Step 1: Open Schematic layout in the PCB Designing software
Step 2: Place the components with respect to the circuit diagram
Step 3: Wire the components as per the circuit diagram
Step 4: Use Netlabels to avoid wiring confusions
Step 5: Annotate the components
Step 6: Select the appropriate footprints
Step 7: Check for errors using Electrical Rules Checker
Step 8: Use the Text box to comment on the circuit connections
Step 9: Document the Circuit Schematic
Step 10: Convert the Schematic layout to PCB Layout
Step 11: Update the component footprints from the Schematic layout
Step 12: Set the PCB size
Step 13: Place the components as per the application requirement
Step 14: Set the track width for different current/signal paths
Step 15: Route tracks between the components
Step 16: Use Silk layers to identify components, test points and board name
Step 17: Place vias at the near edges of the PCB layout

Step 18: Perform Design rule check
Step 19: Generate GERBER Files and drill files
Step 20: Document the PCB Layout

4. Draw a flowchart illustrating the process to clone the designs print demo application, make changes to the home.html file, create a GitHub account and upload the files. Enable Github Actions and deploy your application on Heroku. (20 Marks)

Answer key:

- **Keywords** - Git, Setup, Config, Init, Checkout, Branch, Merge, Ignore, Move, remove, Loh, Diff, Commit, Push, Message, Buildpack, Nodejs, PaaS, Deploy, Build, Master, PHP, GitHub Actions, Automatic Deploys
- **Grant 20 marks** if the flow chart has a minimum of 10 steps and any 10 words from Answer Key
- **Grant 15 marks** if steps are less than 10 in the flow chart and word match in the answer key is less than 10
- **Grant 10 marks** if steps are less than 10 and word match in key in less than 8 from the answer key

QUIZ / MCQs

Module 1 - Design Fundamentals

1. Design Thinking is
    A. Thinking about design
    B. Designing ways in which people think
    C. Asking users to solve problems
    D. Defining, framing and solving problems from users' perspectives
2. What are the steps of the Design Thinking Process?
    A. Understand > Draw > Ideate > Create > Test
    B. Empathise > Define > Ideate > Prototype > Test
    C. Empathise > Design > Implement > Produce > Test
    D. Understand > Define > Ideate > Produce > Try
3. Design Thinking typically helps in _____
    A. **Innovation**
    B. Data analytics
    C. Financial planning
    D. Operational efficiency
4. One needs to have professional training in design to become a design thinker.
    A. True
    B. False
5. Which of the following well known consulting firms are offering Design Thinking as a solution?
    A. McKinsey & Co
    B. BCG
    C. Bain & Co
    D. All of above
6. What happens in the test stage of design thinking?
    A. You conduct a written test of your design team
    B. You allow consumers to test a product or service
    C. You engage in internal testing with employees
    D. You test products designed by competitors.
7. Collecting _____ is an important portion of testing a prototype in the test stage of design thinking.
    A. Pictures
    B. Money
    C. Feedback
    D. Emails
8. How does the test stage of design thinking allow you to make tweaks and refine your prototype?
    A. By observing and talking to customers, you can learn whether your product hits the mark.
    B. By testing employees' knowledge of the product, you can start designing packaging.
    C. By talking with other designers, you can learn ways to redesign to make more money.
9. What is the first and most basic element of design?
    A. Line

B. Shape
C. Color
D. Size

10. The area around or between elements in a design.
    A. Texture
    B. Space
    C. Balance
    D. Color
11. What design discipline is Dieter Rams famous for?
    a. Graphic design
    b. Fashion design
    c. Industrial design
    d. Web design
12. During the 1970s, Rams started to define his approach to "good design" by forming ten principles. Which is NOT one of these principles of "good design"?
    a. Good design is honest.
    b. Good design is related to expensive materials.
    c. Good design is as little design as possible.
    d. Good design is thorough down to the last detail.
13. What is the first step in the design process?
    a. Make a prototype
    b. Market your idea
    c. Test and retest
    d. Identify the problem or the need
14. After building a paper aeroplane, you throw it and it immediately crashes. You realize that there is a major flaw in your design. What should be the next step?
    a. Destroy the old airplane and start from scratch
    b. Change the design and test it again
    c. Use a different color paper
    d. Keep trying with the same design
15. What is the main goal of the design process?
    a. To write reports
    b. To make things
    c. To make charts and graphs
    d. To find solutions to problems
16. Which of the following is the correct definition of a target audience.
    a. People who will create the presentation
    b. People who the product is aimed for
    c. People who holds a target
    d. People who are making the product
17. Which of the following is a service business?
    a. Grocery delivery
    b. Clothes with UV protection
    c. Tanning swimsuits
    d. Self cleaning carpet
18. What are the contents of a Service Design Package?
    a. Requirements, including business, service applicability (how and where the service should be used), stakeholders, functional requirements, service level requirements, service and

operational management requirements, service design, organisational readiness assessment, Service Lifecycle plan (covering the Lifecycle of the service) and a Service Transition and operation plan

b. Functional requirements, business requirements, Service Transition and operation requirements, service acceptance criteria (SAC), process requirements, metrics and measurements requirements, governance requirements, HR and legislative requirements, information security requirements and constraints

c. Strategic assessment and requirements, governance requirements, constraints, tests and predicted results, service acceptance criteria (SAC), organisational readiness assessment, Service Lifecycle plan (covering the lifecycle of the service), third party requirements and constraints, financial constraints and desired return on investment (ROI), required business value on investment (VOI), stakeholder access requirements

d. Defined IT and business requirements, including fit for purpose (Utility) and fit for use (Warranty), timescales, test conditions and predicted results, service acceptance criteria (SAC), build, test, deployment and operational support and maintenance plans, constraints, both theoretical and actual, desired return on investment (ROI), required business value on investment (VOI), stakeholder input and access requirements and a definition of required measurements and metrics

19. Colours can give people a feeling of emotion (hence the phrase "seeing red" for being angry).
    a. True
    b. False
20. If the elements of art are the ingredients of art, _____of design are the recipes that describe how to combine them
    a. Colour
    b. Principles
    c. Form
    d. Line

Module 2 - System Thinking and Reverse Engineering

1. System thinking is
    A. A specific teaching program
    B. Thinking systematically
    C. A subject with a curriculum
    D. A mode of reasoning
2. System thinking can be used for
    A. To understand behaviour
    B. To inform decisions
    C. To support design
    D. All of the above
3. Consider the following statements:

    Statement A: Systems thinking can be defined as: "... an interdisciplinary study of organisation and relationship."

    Statement B: A system can be defined as: "...a complex of directly and indirectly related elements which operate to attain a goal or objective."

    Which of the following combinations is correct?

    A. Statement A is False and Statement B is True.
    B. Statement A is True and Statement B is False.

C. Statement A is True and Statement B is True.

D. Statement A is False and Statement B is False.

4. A word "**System**" in the system thinking can be defined as
   - **A. A set of entities & their relationships**
   - B. Uniform throughout inconsistency
   - C. A set of entities without relationship
   - D. A homogeneous product to forms no relationship
5. Is system thinking and system architecture one and the same
   - A. Yes
   - B. **No**
6. A system should have
   - A. Form
   - B. Function
   - **C. Both**
   - D. None
7. The emergent of a system should be
   - A. A function of one of the entities
   - B. A function of two entities interacting with each other
   - C. A function of any entity acting separately
   - **D. A function that emerges because of the interaction of all its entities**
8. For which class of emergent functions to we design a system for
   - **A. Desirable / Anticipated**
   - B. Undesirable / Unanticipated
   - C. Desirable / Unanticipated
   - D. Undesirable / Anticipated
9. What is the emergent when glass and sand is brought together as a time glass
   - A. Flow of sand
   - B. Zooming possibility using Glass
   - **C. Keeping time**
   - D. None of the above
10. What is considered an emergency?
    - A. Desirable / Anticipated
    - **B. Undesirable / Unanticipated**
    - C. Desirable / Unanticipated
    - D. Undesirable / Anticipated
11. The Form is what the system …… and Function is what the system …….
    - A. Looks like/behaves
    - B. Does/is
    - **C. Is/does**
    - D. Behaves/looks like
12. What could be said has the emergent function of the solar system
    - A. Sustaining life
    - B. Sustaining the planets in motion
    - **C. Maintaining a constant solar flux**
    - D. Producing heat energy
13. What is the technique to decompose entities function / form from system function / form

    1 Zooming > < Emergence

2 Aggregation > < Decomposition
3 Hierarchical > < Decomposition
4 Zooming > < Form
Options to choose
A. 3,4
B. 1,3
C. 1,2
D. 1,4

14. Reverse engineering is the process of deriving the system design and specification from its
A. GUI
B. Database
C. Source code
D. All of the mentioned

15. Reverse engineering and Re-engineering are equivalent processes of software engineering.
A. True
B. False

16. Which of the following is not a proper use of Reverse Engineering for ethical hackers?
A. Check for poorly designed protocols
B. Cracking for making paid apps free for use
C. Check for error conditions
D. Testing for boundary conditions

17. A product engineer or an industry may go for reverse engineering because
A. To analyze the design feature
B. Redocumentation of the old product
C. Interfacing of external devices
D. All of the above

18. Reverse engineering can be defined as a product that can be broken down into different modules which can be used to study further
A. True
B. False

19. Changing the inter-connects of the system leads to the different behaviour of the system is known as system change
A. True
B. False

20. Consider the following statements:
a. All systems are composed of interrelated parts - that is a hierarchical system/subsystem relationship.
b. The parts of the system or subsystem constitute an indissoluble whole.
c. All the subsystems of a system must work together towards the goal of the higher system.
Which (if any) of the above statements are true?
A. Only (a) and (b) are true
B. All of them are true
C. Only (b) and (c) are true
D. None of them is true

Module 3 - User Interface & User Experience

1. What sub-fields does UX (User Experience) Design include?
    a. User Research
    b. Usability Testing
    c. Visual Design
    d. Information Architecture
    e. All of the above
2. What sub-fields does UI (User Interface) Design include?
    a. Interface design
    b. Visual Design
    c. Look and feel
    d. All of the above
3. UI is a subset of UX
    a. True
    b. False
4. UX is the foundation of a building, and the underlying structure and UI is the outward appearance, paint, and visible features like windows, doors, etc. Is this a correct analogy?
    a. Yes
    b. No
5. Which of the following is not a current trend in UI design?

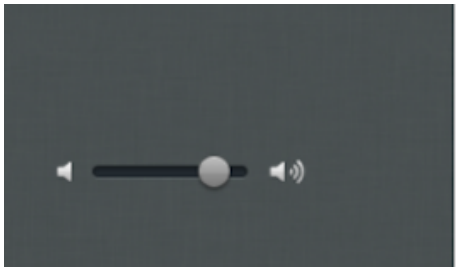
a) Storytelling
b) Video
c) Flat design
d) Shadows and textures

    a. a
    b. a, b
    c. a, b, c
    d. a, b, c ,d
6. Which of the following is (are) current trends in UX design?
    a. Wearables and iOT
    b. Gesture based interaction
    c. Speech based interaction
    d. All of the above
7. The Facebook Like button is an example of a
    a. Microinteraction
    b. Personalisation
    c. Storytelling
    d. All of the above
8. Which UI trend(s) is the Olympics website an example of?

a) Video
b) Storytelling
c) Flat design

    a. a, c
    b. b, a
    c. a , b
    d. a, b, c

9. What is the purpose of micro-interactions?
    a. To keep users informed
    b. To keep users engaged
    c. To make the experience more personal and human
    d. All of the above
10. Which UI element are the following examples of?



    a. Sliders
    b. Popovers
    c. Coachmarks
    d. None of the above

Module 4 - Rapid Prototyping

1. What's the opposite of git clone, instead of downloading your code from GitHub, uploads your changes and code back to GitHub?
    a. Git push
    b. Git add
    c. Git upload
    d. Git status
2. How do you check the state of your local git repository since your last commit?
    a. Git check
    b. Git status
    c. Git commit
    d. Git diff
3. How do you stage files for a commit?
    a. Git stage
    b. Git commit
    c. Git add
    d. Git reset
4. What's a shortcut to staging all the changes you have?
    a. Git commit add .
    b. Git commit .
    c. Git add .
    d. Git push -am “Message”
5. Which of the following is not a CI/CD Service
    a. Github Actions
    b. Circle CI
    c. Bamboo
    d. Maven

6. Hardware Assets like virtual storage, virtual infrastructure, and virtual machines are provided by
    a. SaaS
    b. PaaS
    c. IaaS
    d. CaaS
7. Which of the following build pack is not supported by Heroku
    a. Clojure
    b. Gradle
    c. Julia
    d. Scala
8. Which tool is used to create rounded edges?
    a. Fillet
    b. Chamfer
    c. Hole
    d. Cut
9. The standard metric of measurement unit in CAD?
    a. Cm
    b. Foot
    c. Mm
    d. Inch
10. The dotted lines representation in CAD Software:
    a. Hidden Edges
    b. Projection Lines
    c. Hatching Line
    d. Median Line
11. The Laser Cutter works on which of the following planes
    a. X-Y
    b. Y-X
    c. X-Z
    d. Z-Y
12. Part of 3D Printer that heats up the filament
    a. Nozzle
    b. Extruder
    c. Feeder
    d. Heater
13. A _____ is used to make an electrical connection between the layers of a Multi-Layer PCB
    a. Hole
    b. Via
    c. Trace
    d. Pad
14. A _____ is a plate or board used for placing the different elements that conform to an electrical circuit that contains the electrical interconnections between them
    a. Printed circuit board
    b. Cardboard
    c. Circuit board
    d. Prototyping

15. Which among the following is an input device?

a. LED
b. Timer IC
c. Sensor
d. Microcontroller

16. How many processes are involved in Electronics prototyping?

a. 1
b. 4
c. 7
d. 6

17. The _____ contains the electrical connections between the components on the circuit board

a. Bill of Materials
b. Netlist
c. Copper layer
d. Trace

18. _____is a layer of ink traces used to identify components, test points, parts of the PCB, warning symbols, logos and marks

a. Copper layer
b. Adhesive layer
c. Fabrication layer
d. Silk layer

19. PWR_FLAGS are used to avoid

a. Bus failures
b. Label errors
c. Electrical Rules Checker Error
d. Reverse current

20. For general devices The minimum trace clearance between two conductors should be ___

a. 0.01mm
b. 0.1mm
c. 0.5mm
d. 1mm

Quiz/Polls for the Mentor Sessions

Mentor session 1 [Module 1 - Design Fundamentals (Design Thinking)]:

- Is a driverless car an avatar of design? (**Yes** or No)
- Did you read the article from additional reading “Elon Musk, Tesla, And Design - Build. Creating The Future” (Yes or No)

Mentor session 2 [Module 1 - Design Fundamentals (Elements of Design and Good Design sense)]:

- Line, colour, value, texture, shape, form, and space are considered as (**Elements of design** or Principles of design)
- As a designer - which German company is Dieter Rams most closely associated with? (Sony or **Braun**)

Mentor session 3 [Module 1 - Design Fundamentals (Product & Service)]:

- Are the Product design engineers and Product designers are same (Yes or **No**)
- Did you watch the video from additional reading “Product Design vs Service Design | Service Differentiation by its On-time Delivery” (Yes or No)

Mentor session 4 [Module 2- System Thinking & Reverse Engineering (Introduction to System Thinking)]:

- System thinking is a part of the Computer system (Yes or **No**)
- Did you watch all the videos of System thinning (Yes or No)

Mentor session 5 [Module 2 - System Thinking & Reverse Engineering (Introduction to System Thinking)]:

- How many tasks are there in system thinking (2 or **4**)
- Did you watch the video “Canonical Patterns” (Yes or No)

Mentor session 6 [Module 2 - System Thinking & Reverse Engineering (Reverse Engineering)]:

- Do you know where “Dremel 400” is used for? (Yes or No)
- Have you ever done reverse engineering in your education (Yes or No)

Mentor session 7 [Module 3 - UI UX (Introduction & User Research)] :

- Usability is the part of UI & UX (**Yes** or No)
- Minimalism is a new trend in UI & UX (**Yes** or No)

Mentor session 8 [Module 3 - UI UX (UX & UI Basics)]:

- Interaction designers are part of UX workflow (**Yes** or No)
- Is organizing information inclusive of UI & UX in Google platform (**Yes** or No)

Mentor session 9 [Module 3 - UI UX (Prototyping & Wireframes)]:

- Animated wireframes are a part of Prototypes (**Yes** or No)
- Pen and paper can be used for wireframes (**Yes** or No)

Mentor session 10 [Module 4 - Rapid Prototyping (Mechanical Prototyping)]:

- Did you download Fusion 360 software? (Yes or No)
- Process of representing an object in 3D is 3D Modelling (**Yes** or No)

Mentor session 11 [Module 4 - Rapid Prototyping (Mechanical Prototyping)]:

- Did you understand the Basic Operations of RD Works (Yes or No)
- Fused Deposition Modelling is a layer in the additive manufacturing process (**Yes** or No)

Mentor session 12 [Module 4 - Rapid Prototyping (Electronic Prototyping)]:

- Selection of components is essential in Electronic Prototyping (**Yes** or No)
- Internal connection to be done first in Routing (**Yes** or No)

Mentor session 13 [Module 4 - Rapid Prototyping (Software Prototyping)]:

- Do you have an account in Github? (Yes or No)
- IaaS is a set of compute and networking (**Yes** or No)

Reading Materials

Module 1 - Design Fundamentals

- Design Thinking - Click here for Reading Material
- Elements of Design - Click here for Reading Material
- Good Design sense - Click here for Reading Material
- Product & Service - Click here for Reading Material

Module 2- System Thinking & Reverse Engineering

- System Thinking - Click here for Reading Material
- Other Online Reading Materials
    - Unlocking the Power of Systems Thinking
        - https://medium.com/disruptive-design/unlocking-the-power-of-systems-thinking-b3809eaab519
    - Introduction to System Thinking - Daniel H.Kim
        - https://thesystemsthinker.com/wp-content/uploads/2016/03/Introduction-to-Systems-Thinking-IMS013Epk.pdf
    - Thinking in Systems - Donal H.Meadows
        - https://wtf.tw/ref/meadows.pdf
    - Systems Thinking Speech by Dr. Russell Ackoff
        - https://www.youtube.com/watch?v=EbLh7rZ3rhU
    - Russ Ackoff had given a TED Talk
        - https://www.youtube.com/watch?v=OqEeIG8aPPk
    - System Thinking 101
        - https://www.unschools.co/journal-blog/2019/8/11/week-14-systems-thinking-101

Module 3 - UI UX

- Introduction & User Research - Click here for Reading Material
- UX & UI Basics - Click here for Reading Material
- Prototyping & Wireframes - Click here for Reading Material

Module 4 - Rapid Prototyping

- Mechanical Prototyping
    - https://formlabs.com/blog/ultimate-guide-to-prototyping-tools-for-hardware-and-product-design/
- Electronic Prototyping
    - https://docs.kicad-pcb.org/
    - https://www.tinkercad.com/learn/circuits

- Software Prototyping
    - https://guides.github.com/
    - https://devcenter.heroku.com/start
    - https://docs.github.com/en/free-pro- team@latest/actions/guides

Peer Evaluation

Instructions:

* One Person must Evaluate another based on their contributions for the team activities
* The marking must be fair enough and appropriate to the respective parameters

1. Your Full Name
2. Enter your full Roll No
3. KCT Mail ID
4. Your Team Name (Ex: C1_Team 12)
5. Your Department
6. Select your Cohort
    a. Cohort 1
    b. Cohort 2
    c. Cohort 3
7. Name of the peer in your team for the evaluation
8. Peer's Roll No

Please rate the individual's contribution on the scale of 5 *(1 - least and 5 - high)*

a. Group member participated fully in all the group or team meetings
b. Group member involved in building solutions as a team
c. Group member treated others respectfully and shared the workload fairly
d. Group member offered detailed, constructive feedback when appropriate
e. Group member completed assigned tasks on time

9. Any remarks that you like to share?

Feedback and Suggestion Questionnaire

Design Sprint | Feedback and Suggestions

Dear Students,

Please submit feedback regarding the Design Sprint Course you have just completed, including feedback on course structure and content.

Thank you.

* Required

Your Name *

Your answer

Roll No *

Your answer

Department *

Choose

Cohort *

Choose

Mentor Name *

Your answer

Responsiveness of the Mentor *

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
All the assignments and MCQs were conducted on time	○	○	○	○	○
Mentor prompted to ask queries during Live sessions	○	○	○	○	○
Interaction with Mentor helped in clearing doubts	○	○	○	○	○

Course content

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Learning objectives were clear	○	○	○	○	○
Course Content was useful to understand the necessary concepts	○	○	○	○	○
Course content was well organised	○	○	○	○	○
Course allowed the students to participate as team	○	○	○	○	○
Course content allowed the students to learn required tools & techniques to prototype rapidly	○	○	○	○	○

The module you liked in Design Sprints

- [ ] Module 1 - Design as a Language
- [ ] Module 2 - System Thinking and Reverse Engineering
- [ ] Module 3 - User Interface & User Experience (UI & UX)
- [ ] Module 4 - Rapid Prototyping

What aspects of this course were most useful or valuable?

Your answer

Your suggestions to improve this course?

Your answer

Rate the Overall Design Sprint Course *

	1	2	3	4	5	
Low	○	○	○	○	○	High

Submit

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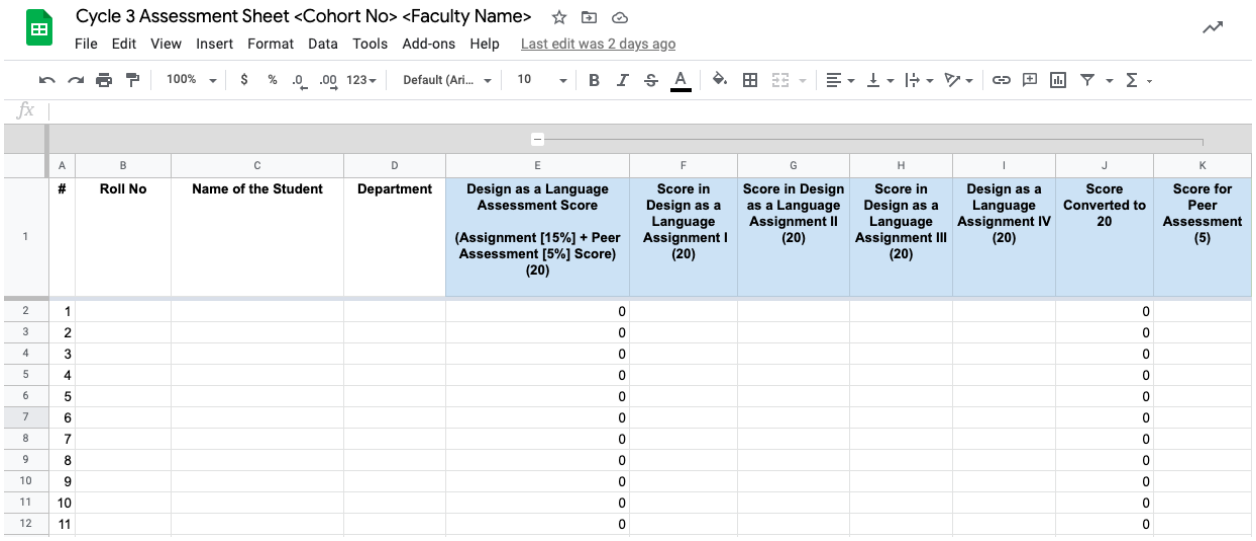
Mentor Assessment Sheet

Scoring Sheet For the Assignment:



Cycle 3 Assessment Sheet <Cohort No> <Faculty Name>

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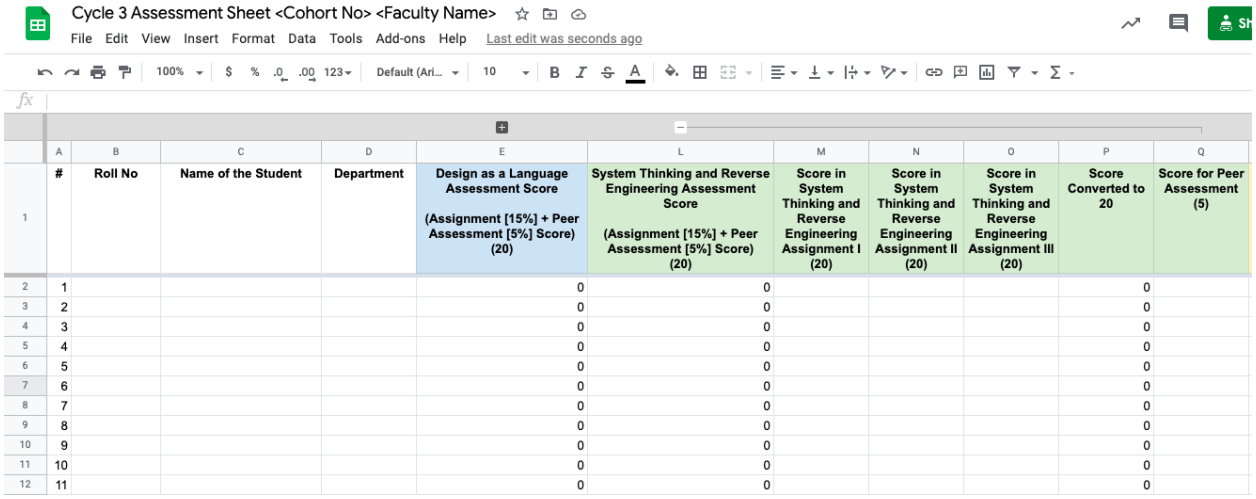
#	Roll No	Name of the Student	Department	Design as a Language Assessment Score (Assignment [15%] + Peer Assessment [5%] Score) (20)	Score in Design as a Language Assignment I (20)	Score in Design as a Language Assignment II (20)	Score in Design as a Language Assignment III (20)	Design as a Language Assignment IV (20)	Score Converted to 20	Score for Peer Assessment (5)
1										
2	1			0					0	
3	2			0					0	
4	3			0					0	
5	4			0					0	
6	5			0					0	
7	6			0					0	
8	7			0					0	
9	8			0					0	
10	9			0					0	
11	10			0					0	
12	11			0					0	



Cycle 3 Assessment Sheet <Cohort No> <Faculty Name>

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#	Roll No	Name of the Student	Department	Design as a Language Assessment Score (Assignment [15%] + Peer Assessment [5%] Score) (20)	System Thinking and Reverse Engineering Assessment Score (Assignment [15%] + Peer Assessment [5%] Score) (20)	Score in System Thinking and Reverse Engineering Assignment I (20)	Score in System Thinking and Reverse Engineering Assignment II (20)	Score in System Thinking and Reverse Engineering Assignment III (20)	Score Converted to 20	Score for Peer Assessment (5)
1										
2	1			0	0				0	
3	2			0	0				0	
4	3			0	0				0	
5	4			0	0				0	
6	5			0	0				0	
7	6			0	0				0	
8	7			0	0				0	
9	8			0	0				0	
10	9			0	0				0	
11	10			0	0				0	
12	11			0	0				0	

Cycle 3 Assessment Sheet <Cohort No> <Faculty Name>

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	E	L	R	S	T	U	V	W	X	Y	Z
1	Design as a Language Assessment Score (Assignment [15%] + Peer Assessment [5%] Score) (20)	System Thinking and Reverse Engineering Assessment Score (Assignment [15%] + Peer Assessment [5%] Score) (20)	User interface & User experience Assessment Score (Assignment [15%] + Peer Assessment [5%] Score) (20)	Score in User interface & User experience Assignment I (20)	Score in User interface & User experience Assignment II (20)	Score in User interface & User experience Assignment III (20)	Score in User interface & User experience Assignment IV (20)	Score in User interface & User experience Assignment V (10)	Score in User interface & User experience Assignment VI (10)	Score Converted to 20	Score for Peer Assessment (5)
2	0	0	0							0	
3	0	0	0							0	
4	0	0	0							0	
5	0	0	0							0	
6	0	0	0							0	
7	0	0	0							0	
8	0	0	0							0	
9	0	0	0							0	
10	0	0	0							0	
11	0	0	0							0	
12	0	0	0							0	

Cycle 3 Assessment Sheet <Cohort No> <Faculty Name>

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=(AF7*15/20)+AG7

	E	L	R	AA	AB	AC	AD	AE	AF	AG
1	Design as a Language Assessment Score (Assignment [15%] + Peer Assessment [5%] Score) (20)	System Thinking and Reverse Engineering Assessment Score (Assignment [15%] + Peer Assessment [5%] Score) (20)	User interface & User experience Assessment Score (Assignment [15%] + Peer Assessment [5%] Score) (20)	Rapid Prototyping Assessment Score (Assignment [15%] + Peer Assessment [5%] Score) (20)	Score in Rapid Prototyping Assignment I (20)	Score in Rapid Prototyping Assignment II (20)	Score in Rapid Prototyping Assignment III (20)	Score in Rapid Prototyping Assignment IV (20)	Score Converted to 20	Score for Peer Assessment (5)
2	0	0	0	0					0	
3	0	0	0	0					0	
4	0	0	0	0					0	
5	0	0	0	0					0	
6	0	0	0	0					0	
7	0	0	0	0					0	
8	0	0	0	0					0	
9	0	0	0	0					0	
10	0	0	0	0					0	
11	0	0	0	0					0	
12	0	0	0	0					0	

Scoring Sheet For the MCQ:

Cycle 3 Assessment Sheet <Cohort No> <Faculty Name>

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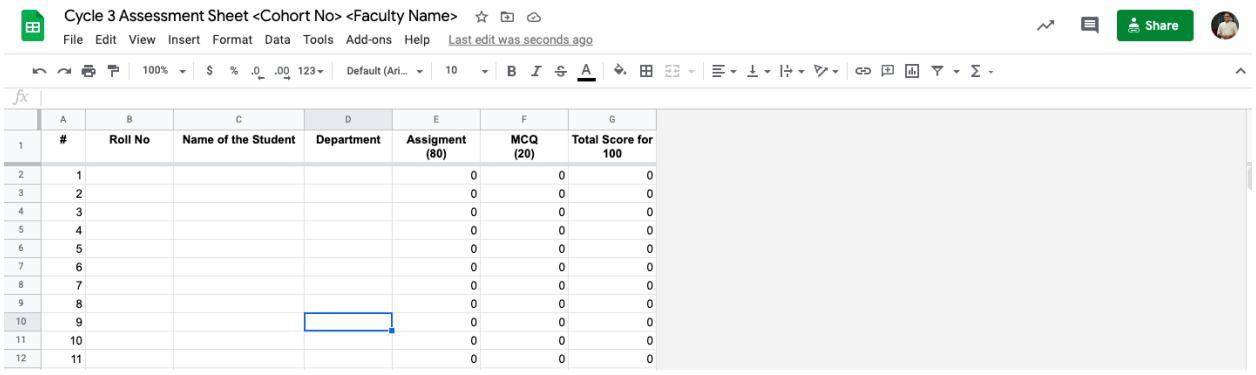
	A	B	C	D	E	F	G	H
1	#	Roll No	Name of the Student	Department	Rapid Prototyping Score (20)	System Thinking and Reverse Engineering Score (20)	User interface & User experience Score (20)	Design Fundamentals Score (20)
2	1							
3	2							
4	3							
5	4							
6	5							
7	6							
8	7							
9	8							
10	9							
11	10							
12	11							

Total Scoring Sheet:



#	Roll No	Name of the Student	Department	Assigment (80)	MCQ (20)	Total Score for 100
1				0	0	0
2				0	0	0
3				0	0	0
4				0	0	0
5				0	0	0
6				0	0	0
7				0	0	0
8				0	0	0
9				0	0	0
10				0	0	0
11				0	0	0

Sprint Analysis

Module 1 – Design as a Language

Forge Syllabus	Type of Video	No. of Handouts/ Reading Materials	Quiz/ MCQs	Assignment Question	Exercise Template for Assignments
Introduction to Design / Design Thinking					
1.1 What is Design ? Understanding the importance of Design	Voice Over Video	1	1	1	1
1.2 Origin of Design	Voice Over Video				
Watch : Cases Study : Design Thinking @ Apple	You Tube Video				
Watch : Design Thinking & Application	You Tube Video				
Watch : Design Thinking & Application	You Tube Video				
Elements and Principles of Design					
2.1 Pre Watch : Dive into Modernism	Web Reading	1	1	1	1
2.2 Pre Watch : Bauhaus	You Tube Video				
2.3 Elements of Design	Voice Over Video				
2.4 Principles of Design	Voice Over Video				
Good Design					
3.1 What is Good design ? Good Design Vs Bad Design	You Tube Video	1	1	1	1
3.2 Dieter Rams 10 Principles of Good Design	You Tube Video				
Watch : Case Study : A brave new world of Product Design	You Tube Video				

Product and Service Design					
4.1 What is Product Design?	Voice Over Video	1	1	1	1
4.2 Difference between Product Design Engineer / Product Designer	Voice Over Video				
4.3 What is Service Design?	Voice Over Video				
	Total :	**4**	**4**	**4**	**4**

Total No of SPREAD Videos. :	**0**
Total No of Voice Over Videos:	**7**
Total No of Youtube Videos. :	**7**
Duration of Module I :	**~37 Min**

Module 2 – System Thinking & Reverse Engineering

Forge Syllabus	Type of Video	No. of Handouts/ Reading Materials	Quiz/MCQs	Assignment Question Set
What is System Thinking				
System Thinking - Peter Senge	You Tube Video	5 materials and 2 Videos	1	1
System Thinking Award Winning Short Film	You Tube Video			
System Thinking Fundamentals				
System Thinking - Introduction in Context to Product Development	Forge's Video			
What is System Thinking	Forge's Video			
Definition of a System	Forge's Video			
Complex System Examples	Forge's Video			
Applied System Thinking	Forge's Video			
Four Tasks of a System Thinker (For Product Development)	Forge's Video			
Task1 - Identify the System Its Form, Its Function	Forge's Video			
Task2 - Identify the Entities of the System their Form, their Function	Forge's Video			
Task3 - Identify the relationships among the entities	Forge's Video			
Task4 - Identify the emergent function	Forge's Video			
Canonical Patterns (Optional)	Forge's Video			
Study of a Complex System				
Basic Components of Causal Loop Diagrams	You Tube Video			
Optional Watch (If Russ Ackoff had given a TED Talk...)	You Tube Video			
Reverse Engineering				

Reverse Engineering Methodologies in context to System Thinking	Forge's Video			
Dremel 4000 Breakdown	Forge's Video			
	Total :	**7**	**1**	**1**

Total No of Forge's Videos. :	**13**
Total No of Youtube Videos. :	**4**
Duration of Module II :	**2 Hr 42 Min**

Module 3 – User Interface & User Experience

Forge Syllabus	Type of Video	No. of Handouts/Reading Materials	Quiz/MCQs	Assignment Question	Exercise Template for Assignments
Introduction to UX UI					
Where does your UX/UI journey start?	SPREAD's Video	1	1	1	1
What is UX/UI/Interaction Design?	SPREAD's Video				
Usability : User Centred Design Principles	SPREAD's Video				
Human Computer Interaction (HCI)	SPREAD's Video				
Trends in UI: An Emerging Field	Voice Over Video				
Basics of User Research					
Introduction to Research	Voice Over Video	1	-	1	1
Types of Research	Voice Over Video				
Research Techniques	Voice Over Video				
Basics of UX					
The UX Design Workflow	SPREAD's Video	1	1	1	1
Examples of great UX	SPREAD's Video				
UI Design Basics					
Information Architecture : Introduction	SPREAD's Video		1	1	1
Understanding the UI components	SPREAD's Video				
Visual Design / Imagery, Color, Shape,	Voice Over Video				

Typography, White Space, Form, Etc					
Basics of Prototyping					
The need for prototyping	SPREAD's Video		-	2	2
Wireframes	SPREAD's Video				
	Total. :	**3**	**3**	**6**	**6**

Total No of SPREAD Videos. :	**10**
Total No of Voice Over Videos:	**5**
Total No of Youtube Videos. :	**0**
Duration of Module III :	**~45 Min**

Module 4 – Rapid Prototyping

Forge Syllabus	Type of Video	No. of Handouts/Reading Materials	Quiz/MCQs	Assignment Question Set
Prototyping 101				
Why Prototyping?	Forge's Video			
Need for Prototyping	You Tube Video			
Mechanical Prototyping				
Introduction to Mechanical Prototyping	Forge's Video			
Basic Geometry, Points, Lines and Planes	You Tube Video			
Working with Fusion 360	Forge's Video			
Introduction to 3D Printing	You Tube Video	1		
Working With Slicer Software	Forge's Video			
Introduction to Laser Cutting	You Tube Video			
Working With RD Works Software	Forge's Video			
Additive Manufacturing	You Tube Video			
Electronic Prototyping			1	1
Introduction to Electronic Prototyping	Forge's Video			
Essential Components for Electronics Prototyping	You Tube Video			
Process Involved in Electronic Prototyping	Forge's Video			
Simulation Tool - Working with Tinker CAD	Forge's Video	2		
Designing a Schematic - KiCAD	Forge's Video			
Foot Print Selection	Forge's Video			
PCB Design	Forge's Video			
Documentation	Forge's Video			
Software Prototyping				
What is Version Control	You Tube Video	3		

What is GitHub	You Tube Video			
The Git & GitHub Tutorial Guides	You Tube Video			
Working with GitBash & GitHub	Forge's Video			
What is Continuous Integration	You Tube Video			
GitHub Actions	You Tube Video			
Setting Up Github Actions	Forge's Video			
Platform as a Service	You Tube Video			
Working With Heroku	Forge's Video			
	Total. :	**5**	**1**	**1**

Total No of FORGE Videos. :	**15**
Total No of Youtube Videos. :	**12**
Duration of Module III :	**5Hr 46 Min**

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Growth Partner

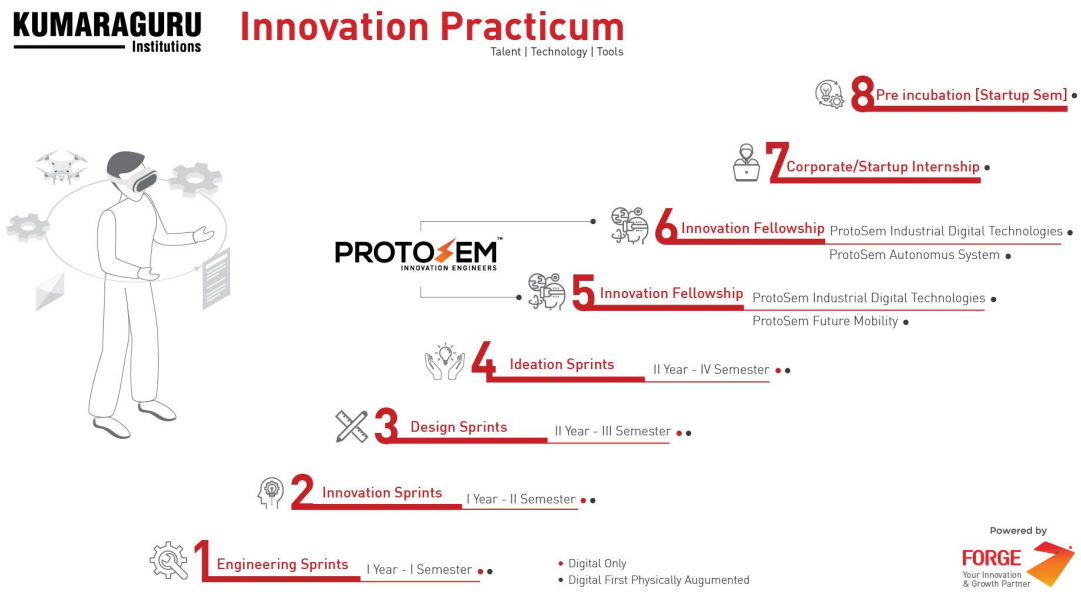
Forge Academy

Innovation Practicum | Ideation Sprints

Innovation Practicum

Innovation Practicum drives the institution's innovation outcomes through defined processes, methods and frameworks. This facilitates the strengthening of the innovation ecosystem in the Institution, by providing students & educators to build capabilities in innovation, technology and design. The **Innovation Centric Curriculum** delivered in a **Learner Centric Pedagogy** enables the transformation of students/educators into Innovation engineers/mentors capable of building innovative solutions for real-world problems. This also becomes a playbook for academic Institutions to foster a state of the art infrastructure conventionally termed as **Centres of Excellence** in partnership with Industry through Government funding schemes like Idea Labs**,** with the capacity of transforming an idea into a prototype. The platform essentially helps build a sustainable model to accelerate the number of product innovations, patents, grants, internship and differential employability outcomes enabled by innovation coaches, startup veterans, technology experts and industry professionals.

Innovation Practicum comprises a sequence of courses designed at the grassroots levels providing opportunities to identify and harness the real power of technology to solve industrial problems and challenges. It focuses on **Tools, Technology** & **Talent** delivered through Sprints & ProtoSem supported by technical resources, tools, equipment, etc. that are required across the entire spectrum of the innovation process.



Capacity Building | iMentor May 2021

Qualified mentors are the agents of change who motivate, guide and facilitate young minds to embrace a spirit of problem-solving and innovation to develop solutions for real-world challenges.

Forge Academy has organised a 2-day program to transform educators into InnovationMentors through capacity building, competency development and career development. With substantial skills and competencies in innovation, and the approach to teaching & learning, developed through this program, 52 educators will be able to guide the students in their pursuits of developing innovative solutions to real-world challenges in a flipped classroom, very different from the conventional method adopted for classroom teaching in delivering InnovationPracticum, a 4-year adjunct program to engineering education.

Details of Attendees from Kumaraguru College of Technology:

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4	Manikandaprasath.K	MEC	manikandaprasath.k.mec@kct.ac.in
5	Nithyaroopa.s	CSE	nithyaroopa.s.cse@kct.ac.in
6	Senthilkumar.B	MEC	senthilkumar.b.mec@kct.ac.in
7	Syedalifathima.SJ	CSE	syedalifathima.sj.cse@kct.ac.in
8	Saravana kumar S	EIE	saravanakumar.s.eie@kct.ac.in
9	P. Nandha Kumar	CIVIL	nandhakumar.p.ce@kct.ac.in
10	Karthika K	ECE	karthika.k.ece@kct.ac.in
11	Manivelmuralidaran.V	MEC	manivelmuralidaran.v.mec@kct.ac.in
12	Dr. P Sivakumar	TXT	sivakumar.p.txt@kct.ac.in
13	Senthilkumar.V	CSE	senthilkumar.v.cse@kct.ac.in
14	Sindhuvaardini.U	CIVIL	sindhuvaardini.u.ce@kct.ac.in
15	Suresh.S	MEC	suresh.s.mec@kct.ac.in
16	David.S	ECE	david.s.ece@kct.ac.in
17	G.Karthikeyan	CIVIL	karthikeyan.g.ce@kct.ac.in
18	Muruganantham.VR	MEC	muruganantham.vr.mec@kct.ac.in
19	Ms.P.Shenbagam	IT	shenbagam.p.it@kct.ac.in
20	Timothy	ECE	timothy.ece@kct.ac.in
21	V.Senthil Kumar	CIVIL	senthilkumar.v.ce@kct.ac.in
22	R.Vijayanandh	AERO	vijayanandh.r.aeu@kct.ac.in
23	Darwin.R	ECE	darwin.r.ece@kct.ac.in
24	Pradeep.P	MEC	pradeep.p.mec@kct.ac.in
25	Suryaprakash.S	EEE	suryaprakash.s.eee@kct.ac.in
26	Dr D.Chandrakala	ISE	chandrakala.d.cse@kct.ac.in
27	Dr S.Rajini	CSE	rajini.s.cse@kct.ac.in

28	Dr.S.Nithyapriya	BT	nithyapriya.s.bt@kct.ac.in
29	Dr.S.John Alexis	AUTO	johnalexis.s.auto@kct.ac.in
30	Balaji V R	EEE	balaji.vr.eee@kct.ac.in
31	Vinothkumar. N	EEE	vinothkumar.n.eee@kct.ac.in
32	Anushree.G	EEE	anushree.g.eee@kct.ac.in
33	Mr.S.Kanagaraj	IT	kanagaraj.s.it@kct.ac.in
34	V. Manimekalai	EIE	manimekalai.v.eie@kct.ac.in
35	P. Magudapathi	MCE	magudapathi.p.mce@kct.ac.in
36	Dr. R. Venkatesan	MCE	venkatesan.r.mce@kct.ac.in
37	M. SaravanaBalaji	EIE	saravanabalaji.m.eie@kct.ac.in
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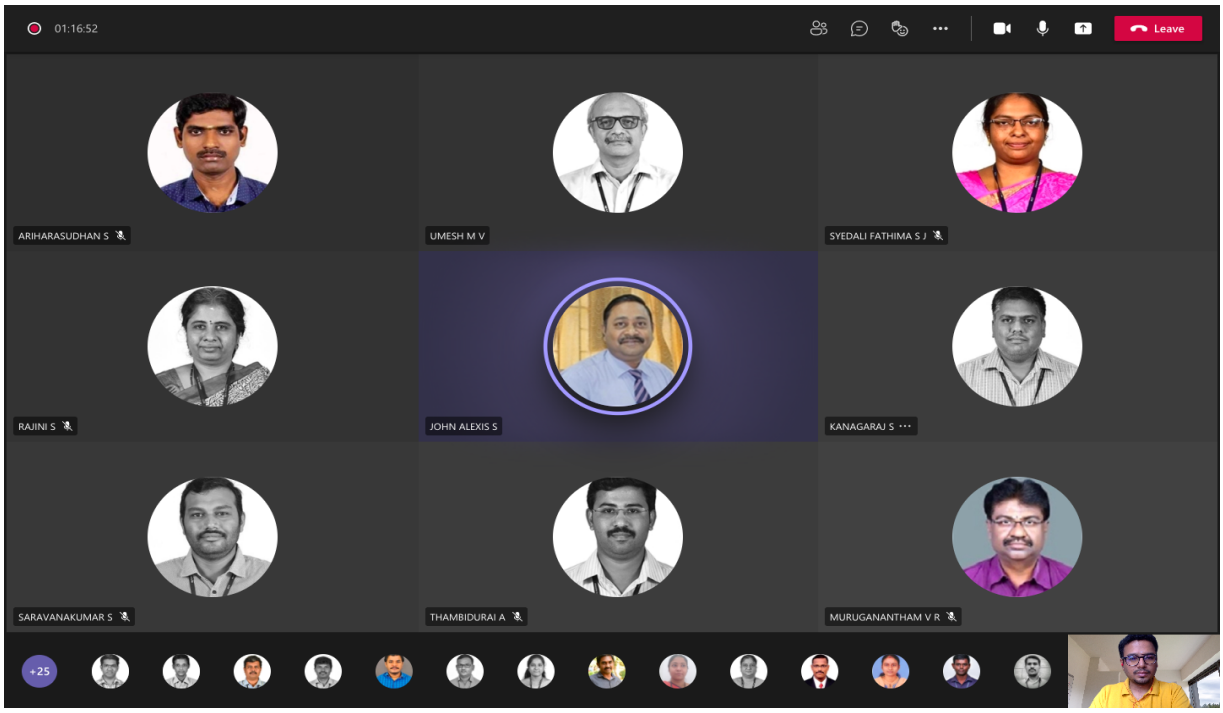
iMENTOR
INNOVATION MENTORS
Transforming
Educators to
Innovation Mentors
31th May & 01st
June, 2021
9.00 am - 5:30 pm
Virtual
Umesh M V | Associate Professor, KCT
+91 96000 85001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ARIHARASUDHAN S
UMESH M V
SYEDALI FATHIMA S J
RAJINI S
JOHN ALEXIS S
KANAGARAJ S
SARAVANAKUMAR S
THAMBIDURAI A
MURUGANANTHAM V R
+25

Ideation Sprint Batch - I

An opportunity for non-stop ideation, hacking, designing the MUP [Minimum Usable Prototype] and preparing Grant Proposals under the mentorship of Innovation Mentors. The goal is to equip the participants with skills & competencies that are critical to succeed in innovation and rapidly go from an idea to a useful, usable, and technically feasible solution.

A 7-day Ideation Sprint offers a systematic and structured process of problem validation, MUP ideation and a 72-hour Hackathon to build a PoC under the guidance of Innovation Mentors. 688 Students from 2nd year UG courses at KCT including the lateral entry were grouped in teams of 6 each to work on real-time problems and challenges sponsored by the industry, government, or social sector etc, and demonstrate the core features of the solution that is most likely to become permanently deployed or used by the target customer/user.

TeamForge facilitated 23 Hack Shops & 40 mentor hours to help them apply the tools & techniques to validate the problem & discover the target customer so as to achieve fast-tracked success in this program. Participants also get trained and mentored in preparing a Grant Proposal document which can then be processed by the innovation mentors to seek funding support from DST, TIDE, IVP, Corporate Innovation Grants etc.

Two Jury panels were scheduled to validate the top 36 innovations of Batch I. Esteemed Alumni of KCT who were the Industry experts and Domain Professionals, were part of the Panels.

- K.R. Ananth, Professor of Practice (Aerospace) and Director Aerospace Design at GITAM University
- Parthiban Selvaraj, Dy.Manager Business Development, BGR Energy Systems
- Dr Paramasivam K, Professor, Kumaraguru College of Technology
- Dr Abirami. V, Assistant Professor, Kumaraguru College of Technology
- Dr Anil Kumar KK, Professor & Head, Kumaraguru College of Technology
- Suryaprakash S, Assistant Professor, Kumaraguru College of Technology
- Umesh MV, Professor, Kumaraguru College of Technology
- Gokul Kumar, CTO, Forge
- Dr Lakshmi Meera, AVP & Head - Forge Academy
- Deepak N, Program Manager, Forge
- Hari Vimalesh, Program Lead, Forge Academy
- Ashok Kumar M, Program Lead, Forge Academy

Metrics that Matter

- 688 Students
- 115 Teams
- 23 Innovation Mentors
- 50+ Challenge Statements
- 36 Teams of Innovation Finalist

Schedule For Ideation Sprints

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DAY 1

Day 1 - FN | Introduction & Innovation 101

- Live Session 1 (Zoom):
  - Introduction to Ideation Sprint
  - Innovation 101
  - Innovation Sprint Overview
  - Onboarding of students in Miro Platform
  - Challenge Curation (Problem Selection)
- Activity 1: Identifying the challenge statement

Day 1 - AN | Innovation 101 and Problem Validation & Customer Discovery

- Knowledge Sessions (Online):
  - Need of innovation tools
  - FORGE Innovation Tool Kit - Introduction video
  - Forge Innovation Rubric (FIR)
  - Product Innovation Hypothesis (PIH)
  - Problem Validation & Customer Discovery (PVCD)
- Activity 2: Initial Scoring the Product innovation using FIR Rubric

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DAY 2

Day 2 - FN | Problem Validation & Customer Discovery and Designing & Crafting Value Proposition

- Live Session 2 (Zoom):
  - Introduction to CB
  - User guide for developing CB
  - Value proposition
  - Identifying pains & gains
  - Crafting value proposition
  - Value Proposition Canvas Explained

Day 2 - AN | MUP Solution Concept Exploration & Design Generation

- Live Session 3 (Zoom):
  - Why & Need of Concept Generation
  - MUP Concept Generation
  - MUP Concept Assessment
  - MUP Tech Canvas
  - Product Canvas
  - MUP Canvas Case Study
  - BoM Generation & Optimization
  - Need for Quality Pitch Presentation

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DAY 3

Day 3 - FN | Proof of Concept Development & Demonstration

- Activity 3: Constructing Hypothesis using PIH in Miro board
- Activity 4: Customer Interview

Day 3 - AN | Proof of Concept Development & Demonstration

- Activity 5: Problem Validation & Customer Discovery Canvas in Miro board
- Activity 6: Capturing the customer interview process to validate the scope, significance, magnitude and incidence in the PVCD canvas

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DAY 4

Day 4 - FN | Proof of Concept Development & Demonstration

- Activity 7: Building CB document

Day 4 - AN | Proof of Concept Development & Demonstration

- Activity 8: Crafting Value proposition from the canvas
- Activity 9: Building MUP Concept Generation

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DAY 5

Day 5 - FN | Proof of Concept Development & Demonstration

- Activity 10: MUP Concept Assessment
- Activity 11: MUP Tech Canvas & Product Canvas

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DAY 6

Day 6 - FN | Proof of Concept Development & Demonstration

- Activity 12: PoC Development
- Activity 13: Innovation Proposal

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Day 5 - AN | Proof of Concept Development & Demonstration • Activity 12: PoC Development	**Day 6 - AN | Proof of Concept Development & Demonstration** • Activity 14: 3-Min Pitch Canvas & Recording • Academic Assessments

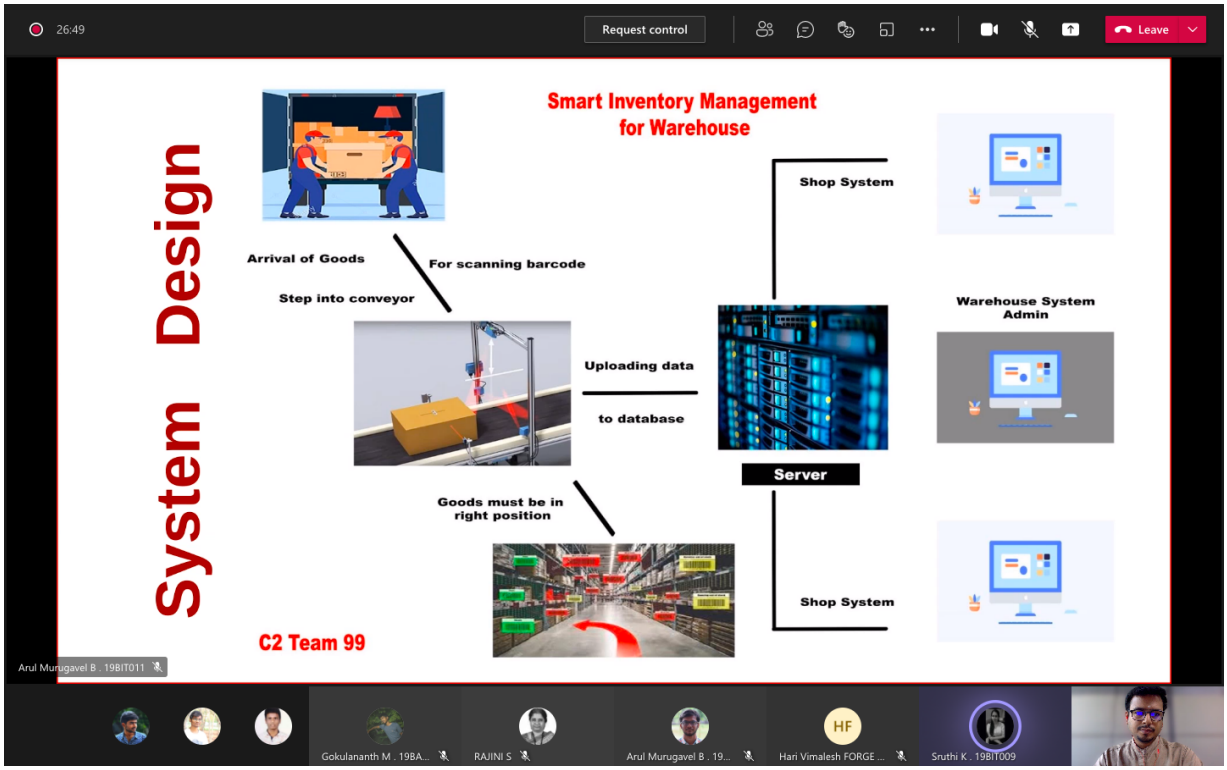
DAY 7

Day 7 - FN | Assessment Day

- **Panel 1:** Top 01-15 teams to Jury Presentation
- **Panel 2:** Top 15- 30 teams to Jury Presentation

Day 7 - AN | Assessment Day

- **Panel 1:** Personal Interview
- **Panel 2:** Personal Interview
- **Panel 3:** Personal Interview
- **Panel 4:** Personal Interview



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19BCE006	ATHISH SELVAN S .	athishselvan.19ce@kct.ac.in
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19BCE008	GOKUL K .	gokul.19ce@kct.ac.in
19BCE009	KAVIN U S .	kavin.19ce@kct.ac.in
19BCE010	MANOJ S .	manoj.19ce@kct.ac.in
19BCE011	PREM KANNAN T C .	premkannan.19ce@kct.ac.in
19BCE012	VETRIVEL E .	vetrivel.19ce@kct.ac.in
19BCE013	SUBHIKA C .	subhika.19ce@kct.ac.in
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19BCE018	ARAVIND BABU SATHYA RAJAKUMAR .	aravindbabu.19ce@kct.ac.in
19BCE019	HARITHARAN N .	haritharan.19ce@kct.ac.in
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Ideation Sprint Batch - II

Ideation sprints offer 7 days, a systematic and structured process of problem validation, and ideation to develop a solution concept (Minimum Usable Prototype). It is aimed primarily at evaluating the intent to pursue technology-powered innovation backed by a high degree of passion to solve real-world problems, create an impact

With the mantra “Right PROTOTYPE and Prototype RIGHT”, students attending the course get guidance from experts to ideate the useful, usable, and technically feasible solutions that are most likely to become permanently deployed or used by the target customer/user. Students are put through a rigorous pitch clinic to articulate the challenge/opportunity identified, insights derived from customer/user interviews, & secondary research and build a solution (Prototype scale) and validate the various hypothesis of the innovation

622 Students from 2nd year UG courses and MCA at KCT including the lateral entry were grouped in teams of 6 each to work on real-time problems and challenges sponsored by the industry, government, or social sector etc, and demonstrate the core features of the solution that is most likely to become permanently deployed or used by the target customer/user. TeamForge facilitated 17 Hack Shops & 40 mentor hours to help them apply the tools & techniques to validate the problem & discover the target customer so as to achieve fast-tracked success in this program.

Two Jury panels were scheduled to validate the top 26 innovations of Batch I. Industry experts and Domain Professionals were part of these Panels.

- Rajashekar Adiga, Director of Engineering at Accord
- Vijayeendra H S, Co-Founder and Director at Avanijal Agri Automation Pvt. Ltd.
- Jeeva B, Assistant Professor, Kumaraguru College of Technology
- Dr M. Alagumeenaakshi, Professor, Kumaraguru College of Technology
- Dr S Rajani, Professor, Kumaraguru College of Technology
- Navaneethakrishnan R, Assistant Professor, Kumaraguru College of Technology
- Umesh MV, Professor, Kumaraguru College of Technology
- Gokul Kumar, CTO, Forge
- Deepak N, Program Manager, Forge
- Hari Vimalesh, Program Lead, Forge Academy

Metrics that Matter

- 622 Students
- 104 Teams
- 18 Innovation Mentors
- 60+ Challenge Statements
- 26 Teams of Innovation Finalist

Schedule For Ideation Sprints

DAY 1	DAY 2
Day 1 - FN | Introduction & Innovation 101 ● Live Session 1 (Zoom): ○ Introduction to Ideation Sprint ○ Innovation 101 ○ Innovation Sprint Overview ○ Onboarding of students in Miro Platform	**Day 2 - FN | Problem Validation & Customer Discovery and Designing & Crafting Value Proposition** ● Live Session 2 (Zoom): ○ Introduction to CB ○ User guide for developing CB ○ Value proposition

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Challenge Curation (Problem Selection)

Activity 1: Identifying the challenge statement

Day 1 - AN | Innovation 101 and Problem Validation & Customer Discovery

Knowledge Sessions (Online):

Need of innovation tools
FORGE Innovation Tool Kit - Introduction video
Forge Innovation Rubric (FIR)
Product Innovation Hypothesis (PIH)
Problem Validation & Customer Discovery (PVCD)

Activity 2: Initial Scoring the Product innovation using FIR Rubric

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Identifying pains & gains
Crafting value proposition
Value Proposition Canvas Explained

Day 2 - AN | MUP Solution Concept Exploration & Design Generation

Live Session 3 (Zoom):

Why & Need of Concept Generation
MUP Concept Generation
MUP Concept Assessment
MUP Tech Canvas
Product Canvas
MUP Canvas Case Study
BoM Generation & Optimization
Need for Quality Pitch Presentation

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DAY 3
Day 3 - FN | Proof of Concept Development & Demonstration

Activity 3: Constructing Hypothesis using PIH in Miro board
Activity 4: Customer Interview

Day 3 - AN | Proof of Concept Development & Demonstration

Activity 5: Problem Validation & Customer Discovery Canvas in Miro board
Activity 6: Capturing the customer interview process to validate the scope, significance, magnitude and incidence in the PVCD canvas

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DAY 4
Day 4 - FN | Proof of Concept Development & Demonstration

Activity 7: Building CB document

Day 4 - AN | Proof of Concept Development & Demonstration

Activity 8: Crafting Value proposition from the canvas
Activity 9: Building MUP Concept Generation

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DAY 5
Day 5 - FN | Proof of Concept Development & Demonstration

Activity 10: MUP Concept Assessment
Activity 11: MUP Tech Canvas & Product Canvas

Day 5 - AN | Proof of Concept Development & Demonstration

Activity 12: PoC Development

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DAY 6
Day 6 - FN | Proof of Concept Development & Demonstration

Activity 12: PoC Development
Activity 13: Innovation Proposal

Day 6 - AN | Proof of Concept Development & Demonstration

Activity 14: 3-Min Pitch Canvas & Recording
Academic Assessments

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DAY 7
Day 7 - FN | Assessment Day

Panel 1: Top 01-15 teams to Jury Presentation
Panel 2: Top 15- 30 teams to Jury Presentation

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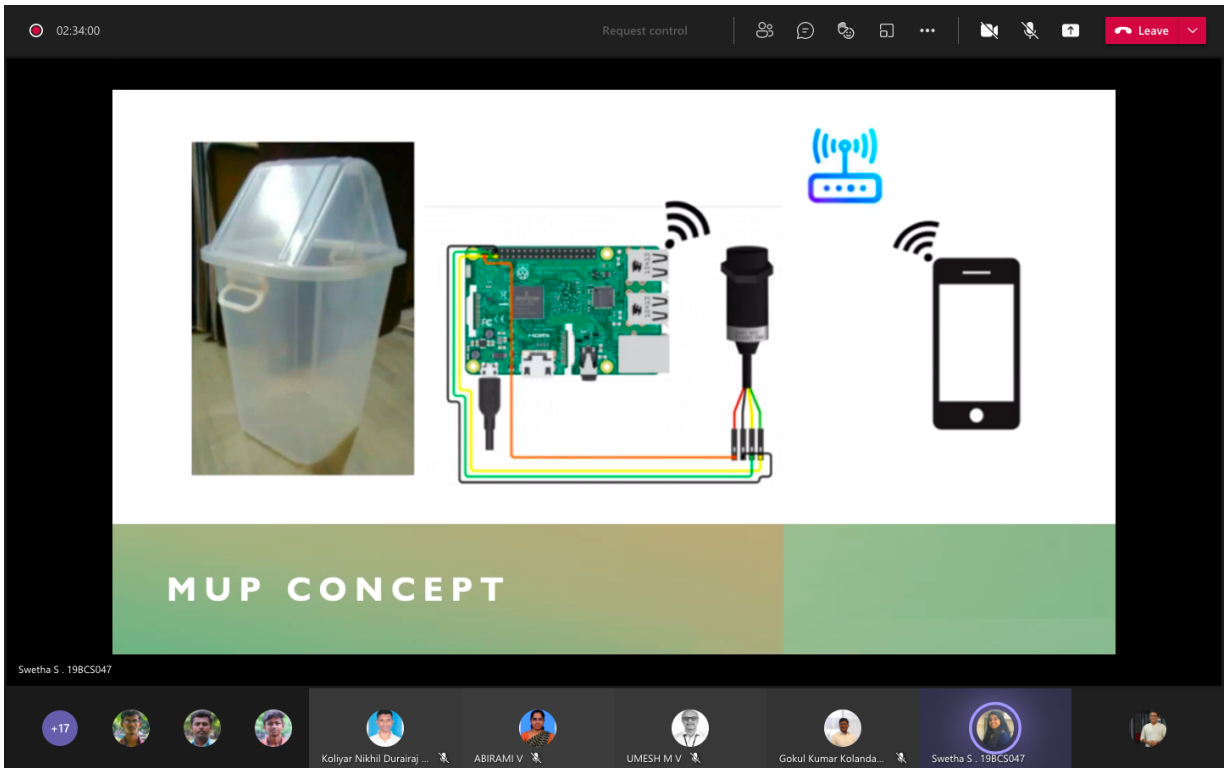
Day 7 - AN | Assessment Day

- **Panel 1:** Personal Interview
- **Panel 2:** Personal Interview
- **Panel 3:** Personal Interview
- **Panel 4:** Personal Interview



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Benefits

- 1250+ students learnt the managed innovation process through our proven tools & techniques
- 219 teams pitched an idea worth prototyping for real-world challenges
- 64 Challenge statements were sourced and validated
- 62 Finalist present to a Jury panel of 12 members consisting of Industry Expert, Faculty members, KCT Alumni and Team Forge
- 52 Faculty members trained as Innovation Mentors
- Top 3 Teams & Shortlisted Student Innovators & Best Innovation Mentors to get further support from Forge
- Patents and Research Publications to be credited to students & Mentors
- 22 hours of learning across Design Thinking, crafting Value Proposition and Solution Concept Exploration & Design Generation

Voice of Students

- PUMENITHA S T (19BEC009) - *"Critical thinking skills were imparted and it helped me improve my team management and problem-solving ability"*
- PRIYADHARSHAN (19BCS012) - *"Proper way of representing our thoughts were taught. Formulating our ideas and understanding how important innovation is and how different it is from a lab solution is very clear"*
- BOOMA N (19BEI202) - *"I have learnt to interact & collaborate with students who were from different departments. I learnt to work with new people. This was the first presentation I did after joining this college. it was a good experience and I feel confident"*
- SIDDHARTH NEHRU S M (19BCE093)- *"It was a platform to think outside the box, and helped gain more technical knowledge"*

Voice of Innovation Mentors

- MOHAMMED FAROOQ ABDULLA F M (ISE) - *"Students gain more knowledge by sharing their ideas for a single problem statement they had chosen and expanded their horizon of learning"*
- SINDHU VAARDINI U (Civil) - *"I liked the way the entire sprint is framed. Very systematically done. It was quite easy for the students to follow and work in groups"*
- KANAGARAJ S (IT) - *"Understanding of the gaps/challenges faced by the target user. Identifying the unique & novel is the solution as compared to other existing solutions available today are the most important facets learnt by the team during the program"*
- MANIVEL MURALIDARAN V (Mechanical) - *"Think innovatively and think of new concepts and interact with the cross-disciplinary student teams effectively" - are important takeaways. The communication skills shall also improve and it helps them to learn a lot of things in a short span"*

PROJECT BASED LEARNING FRAMEWORK

KUMARAGURU
college of technology
character is life

SCHOOL OF
FOUNDATIONAL
SCIENCES

KNOWLEDEGE . CHARACTER. TRANSFORMATION

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Genesis

Background

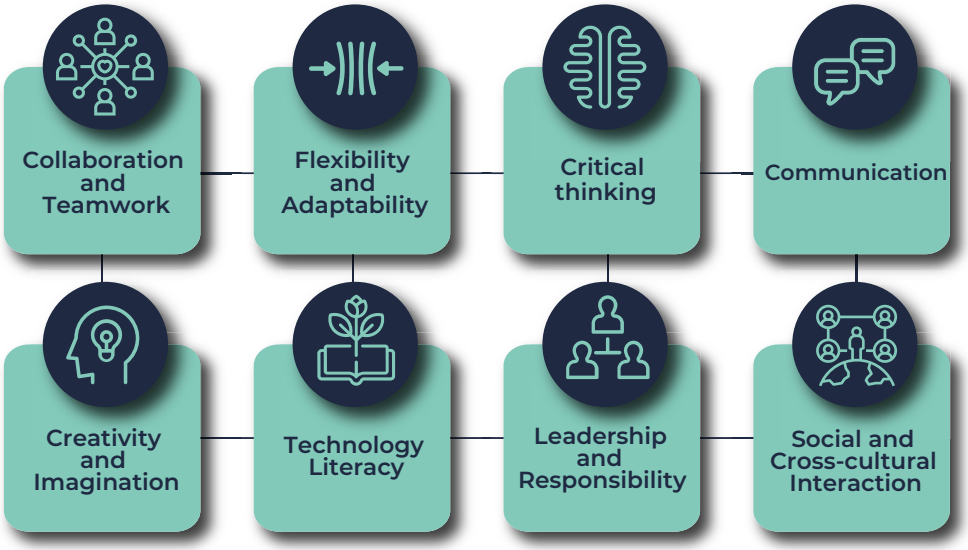
The world is witnessing a metamorphosis in the technical education landscape by the turn of the century and the twenty first century learner is on the lookout for a learning ecosystem that not just feeds information but guides him / her to explore, negotiate, interpret and create. This shift has been driving both the learners and the teachers towards an interdisciplinary, collaborative learning space that warrants qualitative autonomy and deep learning of concepts and principles, where he/she from multiple domains huddle together, with the teacher as a facilitator or a co-learner to explore limitless possibilities in the ocean of science and technology. The teaching fraternity across the globe is deeply engaged in experimenting with several novel learning frameworks to engage the learners.

21st Century Skills

"The term 21st century skills refers to a broad set of knowledge, skills, work habits, and character traits that are believed— by educators, school reformers, college professors, employers, and others—to be critically important to success in today's world."

- Glossary of Education

Critical Dimensions of the 21st Century Skills



The present century is witnessing powerful transformation in education, economy, technology and trade beyond the geographical boundaries. The challenges thrown up by such transformations demand a whole-new skill-set for the individuals to cope-up and convert the challenges into opportunities. These critical dimensions of the 21st century skillsets shall enable the individuals to lead a holistic progress and empower them to contribute to the progress of the society at large.

Relooking Engineering Education

The Need to Redefine Standards

Engineering education in the past century did a significant job in transmitting knowledge, skills and values in ways appropriate for the time. Engineering graduates were to perform the routine and repetitive tasks and these skills were mastered through numerous laboratory exercises and industry-designed case studies. But the present circumstances demand a momentous change in the engineering education which shall prepare the graduates to equip themselves to meet the challenges of the present and future. The proliferation of information, the merging disciplinary boundaries, the ever-growing global market, the endangered environment, the emerging social responsibility and the participatory corporate structures are some of the significant features driving the educators to examine new strategies to tutor, train and mentor the NexGen engineers.

Evolving Pedagogies

The teacher-centric approach that promoted learners to develop their skills in deductive reasoning and succeed in creating a knowledge-base as an inventory of concepts has given way to a new tribe of learner-centric approach where the learners are willing to take risks, eager to explore their own problems rather than teacher-directed or text-directed problems and come up with innovative ideas and new directions. Inquiry-based learning is increasingly being encouraged across the globe and looked upon as the key to transform the present education system. Engaging the learners in the inquiry process facilitate them in formulating questions, conducting investigations, applying information and technology to learning and generating processes and products that illustrate learning. Inquiry-based learning experiences develop the critical thinking skills and offers a sense of accomplishment among the learners.

In Inquiry Based Learning the onus for learning lies on the students, which encourages them to arrive at an understanding of concepts by themselves, following a process that can include:

Deciding on what they need to learn

Categorizing resources and how best to learn from them

Using resources and reporting their learning

Assessing their progress in learning

Some of the successful inquiry-based learning framework include

Design Thinking: Supports and structures the creative process of generating ideas and bringing them into reality through concrete actions and products.

Problem Based Learning: Through active engagement with the problem, learners develop skills around defining problems, identifying the information they need, and finding, evaluating and using information.

Case Study/ Scenario Based Learning: Analysis of specific scenarios that resemble or are real world examples with intense interaction between participants.

Meta-questions: Framing questions designed to structure student work during a whole term within an enveloping investigation and at the end of the term students are asked to produce a comprehensive response to the Meta-question.

Threshold Concept: A portal, opening up a new and previously inaccessible way of thinking about something. It results in the learner understanding, interpreting, or seeing something in a new way.

Project Based Learning: An instructional approach designed to give students the opportunity to develop knowledge and skills through engaging projects set around challenges and problems they may face in the real world.

Kumaraguru Project Based Learning Model

Kumaraguru College of Technology has always served as a catalyst for innovations in teaching learning framework to optimize the educational outcomes in engineering study. To foster a strong synergy in the basic sciences and mathematics along with their application in multiple domains of engineering, Kumraguru Project Based Learning Framework has been introduced in the academic year 2020-21 for the first year B.E./B.Tech. students. The model is drawn from studying the various inquiry-centric learning framework where a top-down approach and a bottom-up approach converge to maximize learning outcomes. The synergy of bottom-up model of Deep Learning and the top-down model of Project Making exercise provides the right blend of learning ecosystem to the students. In this model, the learning happens through providing scientific or engineering design solutions to the existing real-world problems, and it covers the entire foundational core concepts of science and engineering thereby providing a preamble to the project making exercise. This strongly serves to be a student-centred approach of learning, where the faculty members become facilitators and co-learners.

Objectives

- **To drive learners to encounter the central concepts and principles of a subject hands-on.**
- **To facilitate the learners to think independently to come up with the solutions to the real-world problems.**
- **To use technology in meaningful ways to help learners investigate, collaborate, analyze, synthesize, and present their learning.**

Project Based Learning Framework: The Top-down Approach

Project Based Learning is best explained as “Learning by doing.” It is an inquiry-based learning that hones the higher order thinking, applied research skills and collaborative skills. The learners collaborate in smaller teams and identify a problem statement, deep dive into the problem together as a team arrive at plausible solutions under the guidance of mentors. The learners shall seamlessly explore the interconnections among multiple domains such as science, mathematics, technology, management, economics, history, geography and much more. While faculty mentors shall guide the learners with the basic science and math concepts and their engineering praxis, the alumni mentors extend their support in orienting their juniors on the domain-specific application through appropriate technological intervention. The industry mentors have a significant impact in connecting the deep learning occurring in PBL Framework with the real-time application.

Deep Learning Framework: The Bottom-Up Approach

Deep Learning is a problem-based approach followed to impart basic engineering concepts that are prescribed in the curriculum. The teaching-learning process of this model begins with the instructor brainstorming about an existing real-world problem related to the subject along with its possible solutions. The instructor handholds the candidates in providing viable solutions during which all the related engineering and scientific core concepts are explained inclusive of topics from the curriculum and beyond. The concept of same problem having different solutions and the fact that there is no right answer or wrong answer for any problem are also clearly explained. Subsequently, the students are provided with similar open-ended problems, and they are asked to work towards providing design solutions, which range from simple mathematical models to complex engineering designs. The assessments are carried out based on the originality of the work, probability of executing the proposed solution, uniqueness of the design, efforts put in by the candidate, and so on. This type of learning enables the candidates to develop their skills in searching for relevant information, apply the course content to real-world problems and think for possible solutions across the disciplines.

- **Learners build on their prior knowledge, experiences, and interests.**
- **Problem solving, higher order thinking, and deep understanding of concepts and principles are emphasized.**

- **Learners engage in creative and critical thinking, assess their own work, reflect on what they are learning, and set their own goals and objectives.**
- **Errors and misconceptions are viewed as opportunities for learning.**
- **Learners are encouraged to form multiple perspectives and representations of their learning.**
- **Multiple forms of assessment are built in and are an ongoing part of learning.**

Role of the Mentors

The Mentor is the facilitator who creates a learning atmosphere of shared responsibility. Project Based Learning Framework learners are mentored not just by faculty members but also by Senior Students, Alumni and Industry professionals. They steer the learners towards identifying content-based materials, regulate student success with intermittent, transitional goals to ensure student projects remain focused and students have a deep understanding of the concepts being investigated.

Role of the Learners

Learners apply knowledge instead of simply consuming it. Their role is to ask questions, build knowledge, and determine a real-world solution to the issue/ question. Students collaborate to expand their active listening skills and engage in intelligent focused communication. Therefore, it allows them to think rationally on how to solve problems. Students must show what they have learned (content), what they can do (demonstration), and what new skills they have developed. PBL forces students to take ownership of their success.

Learning Strategies

Selection

The first year students are invited for an screening test for the first phase selection process of Kumaraguru Project Based Learning Framework. The short-listed students are invited for a virtual interview. After scrutiny, in Dec 2020, 58 students were selected to be part of the first Cohort of PBL. The selected learners of PBL framework along with their parents were invited to participate in the virtual session where they were oriented about the PBL framework, the versatile learning platform. The learners were grouped into smaller teams and headed to pursue their learning through project and problem-based approach.

PBL Immersion

The selected PBL learners participate in the 10-day PBL immersion programme and the learners are oriented on various pre-requisites for successfully getting initiated into PBL framework. A number of activities during the Immersion programme are scheduled to happen in smaller groups formed in a random order which provides the opportunity for the learners to interact with one another and understand their areas of interest and project ideas.

Design Thinking

Reverse Engineering

Alien Technology

Literature Survey

Nature-inspired Projects

Daily Journal Writing

Sustainable Development Goals

PBL Journey

PBL Immersion Programme is interlaced with a lot of team-building exercises and following this, the learners huddle to form smaller teams that includes 4 to 5 members and narrow down to trace the domain that they intend to explore in PBL framework and further progress to identify the problem statement.

Week 3

The teams after the initial literature survey and discussion with the faculty members and present their Draft Problem Statement at the Zeroth Review and faculty mentors from basic sciences and engineering guide the teams to chisel their problem statement and prod them to explore further.

Week 4

The PBL Framework participants finalise their problem statement, start delving deep into the literature review, identify the research gaps and study the resources and support required for their project under the guidance of faculty mentors who have expertise in those domains that each team is working on.

Week 5

Under the mentorship of faculty mentors, the learners successfully identify the learning objectives and start mobilizing the requisite resources. The mentoring orbit now includes the alumni and industry partners to establish a strong real-world connection to the problem statements that the students are engaged with.

Week 6

The learners are tutored to documenting their research progress through sessions on Reading Research Articles, Drafting Literature Survey, Documenting the Use of Materials and Methodology which guides them to draft their Project report and Research paper.

Week 7

PBL student teams present their progress in the first Project Review to the faculty reviewer, the domain expert and a senior student reviewer invited to gauge the progress of the teams in the presence of faculty and alumni mentors. The Reviewers share their critical feedback and quantify the progress in a grading sheet on specific rubrics.

Week 8,9 & 10

PBL teams progress further in their project, and incorporate the suggestions and insights shared by the reviewers under the guidance of the faculty and alumni mentor. The Industry / Site visits, Interaction with Domain Experts, Procurement of Materials, tools and software required for the projects, Simulation of Models etc... are carried out during this phase.

Week 11

The Second Review of the Project is scheduled and teams present the further progress in the Project. The presentation includes the selection of materials and methods, procedure adopted, the results and findings and the discussion on the results.

Week 12 & 13

The Reviewers share their insights on the project nearing completion. The students perfect on their simulation models, prototypes, research papers and project reports.

Week 14

The Final Project Presentation is scheduled and Industry experts are invited as reviewers. The student teams present their PBL learnings and outcomes. The Industry experts offer their critical feedback and insights to upscale the project and suggestions to progress forward.

Week 15

Students compile their learnings and outcomes and submit the Project Report. Research Papers are sent to scopus-indexed and peer-reviewed journals. Further prospects on converting the simulated models and prototypes into products are explored.

Deep Learning Approach

In the Deep Learning Sessions, the learners are introduced to the real-time problem or a case study. The students are sensitised with a real-time problem through a black-box approach and through the outcomes of the discussion, the learners build the connect between the problem and the concept or theory underlying the problem. This Problem Based Learning Approach encourages active participation of the learners and they have to scope to provide multiple responses as there need not be just one correct solution for the problem.Without any comprise with the syllabus included in the regular curriculum, the learners of PBL are way ahead of the regular mode. For instance, in the Synchronous mode, for the course “Electric Circuit Analysis”, through a simple Electric Wiring Diagram for a Room, the learners are made to inquire and comprehend the various components, their functions and inter-relation. Following this, the learners are explained the concept or theorem and the laws governing the functioning of the components.

In the Asynchronous Mode, the learners are provided ample opportunities to explore and learn further. The learners are provided with Worksheets containing tutorial problems, and Timed Quiz to gauge the pace at which the learners respond and finally an Assignment with Open-Ended Questions. The Worksheets and Timed Quiz are non-graded while the assignment is graded.

Thus the courses included in the curriculum are taught through Problem Based Approach in which the learner takes the onus to understand the application of a device or a component and later connects it with the theorem or the law governing it.

Comprehensive Assessment Strategies

Implementing an innovative learning pedagogy poses numerous challenges and hence the commitment, focus, authentic integration of skillsets, demonstrating, practicing and assessing them becomes paramount. Learning outcomes are the cornerstones of course design and assessment, and help students focus on what is important.

In order to maximise the learning outcome, it is significant to bring about a simultaneous change in instruction, pedagogy and assessment practices. As the focus began with the instructional strategy, it was made to align with outcomes and assessment.

Assessment in Deep Learning Approach : The Deep Learning courses in the curriculum adopted a pedagogical approach in which the assessment reflects the intended outcomes and teaching-learning activities, thereby creating a "backwash" from assessment to classroom activity. The focus of the assessments is neither on what the learner learnt or not nor on what the teacher taught or not. Instead, the focus was on assessing what the student does. This strategy is based on Biggs (1999) Constructive Alignment Design that attend to student activity in a three-step process.

- **First, the curriculum must state a clear objective, and teachers must explicitly state what they want student to address.**
- **Second, the teaching and learning activities must be set up to encourage the kind of cognitive work that meets the stated objective.**
- **Finally, an assessment process must reflect the thinking of the first two steps.**

If the assessment is designed for alignment, based on the above approach, when students focus on the assessment they will be engaging in the processes—the doing—to meet the outcomes.

Alternate Assessments and Assignments

Inquiry Based Learning should encourage students to go beyond demonstrating what they have learned, as “the central activities of the project must involve the transformation and construction of knowledge”. Some of the alternate assessment options practised in PBL include

Open Book Tests

Reverse Engineering of Devices and Gadgets

Daily Journaling

Oral Presentations

Design Thinking Assignments

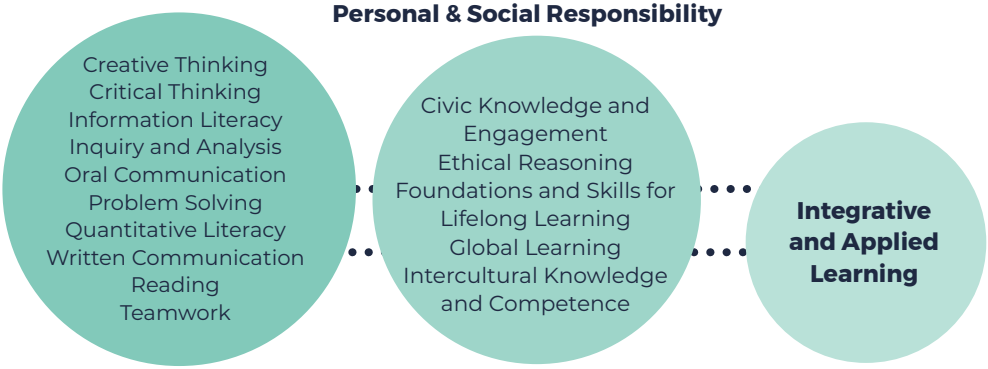
Concept Mapping

Rubrics

Rubrics play a significant role in evaluation of assignments, oral presentations, project reports and tests which aids in assessing the student performance relative to the defined learning outcomes. The following 16 Rubrics, as suggested by Valid Assessment of Learning in Undergraduate Education (VALUE) are used to evaluate the cross-cutting capacities that students develop across courses and program.

Intellectual and Practical Skills

Personal & Social Responsibility



STS
SCHOLASTIC TALK SERIES

Scholastic Talk Series features nationally and internationally renowned academicians and corporate experts, where they engage the learners and faculty mentors in a productive dialogue on diverse topics that impacts the academic community and provides an opportunity for cross-disciplinary learning experience.

The partial list of invited speakers include Prof Emeritus KPJ Reddy, Former Professor from IISC Bangalore turned entrepreneur & Mr Bhuvana Sundar Soorappaiah, Program Manager (Automotive) at Bosch.

Testimonials

PBL Learner

Comparing Project Based Learning to traditional learning, one gets a lot of gains. as we learn by doing things in the practical mode. Through regular reviews with the mentors, I have learnt how to present, read the research paper, different languages and technologies.

Kushar Dogra, *B.Tech IT – 2020-21 Batch*
PBL Cohort I – Crew 10

PBL Faculty Mentor

As a mentor, I am overwhelmed with the commitment, learning ability and technical discussions of the crew. Project based learning is a great initiative to the present scenario.

Dr. Geethakarthi A, *Associate Professor / Civil Engg*

Student Mentor

I hope it's a wonderful launchpad for the freshers to explore and understand the fundamentals in a practical method, analyze their surroundings, spot the need and attempt to solve it.

Ms. Monisha Thangam, *B.E. ECE – 2016-20 Batch*

Faculty Reviewer

Students pursuing interdisciplinary projects in the first year is certainly a novel and welcome move. As a reviewer, I observed that these I year Undergrad students from the PBL mode are on par with PG students in terms of vision and thought process. I am sure, they would do long reaching social projects in the remaining years in KCT.

Dr. Balaji M, *Associate Professor / Mech Engg*

Successful PBL Models across the Globe

Project Based Learning and Problem Based Learning is making headway in technical education more than ever before and institutions that are promoting Competency Based Education and Inquiry Based Learning are largely adopting PBL as their teaching learning framework. Some of the institutions which have successfully implemented PBL Models include University of Wisconsin-Madison, Purdue, University of Michigan, Northern Arizona, Olin, Southern New Hampshire, Worcester Polytechnic Institute and Westminster.

PBL Outcomes in 2020-21

Semester	No of Learners	No of Projects	No of Mentors	No of Publications	No of Prototypes
I	58	12	20+	10	7
II	97	22	45+	18	10+

PBL Projects at a Glance

SEMSTER I Cohort I | 12 Crews | 58 Learners | 20+ Mentors | 12 Projects

Crew No	Project Title
1	Healthcare Automation for monitoring urine level and alerting caretaker via IoT
2	A Pico Satellite for measuring Air Quality
3	A disparate approach to harness Piezoelectric energy
4	A Study on the conversion of Industrial Carbon emissions into Graphene
5	E-Trike
6	IoT Based Smart IV Stand
7	Productivity App for efficient management of production unit at Small Scale Companies
8	Telly-Filly - A software module to aid form-filling through speech interface and OCR technology
9	Industry 4.O+: Accelerating Machine to Machine Communication through Optical Fibre Technology
10	Anneta – An Interfacing Website for Financial Resource Management
11	A Study on the Integrated smart system for urban farming
12	Detection and removal of blockage in submersible pumps

SEMSTER II Cohort I & II | 11 Crews | 11 Cliques | 97 Learners | 45+ Mentors | 22 Projects

Crew No	Project Title
1	An Integrated Application with Analysis and Prediction on Stocks
2	Biomechanically sourced hybrid energy harvester - towards a sustainable environment
3	Farmer's First- Trashing the Trio !
4	Portable Oxygen Concentrator
5	Automatic Alert System for Vehicles
6	2 Factor Authentication and Sentry mode for Automobiles to Enhance Cyber-Safety
7	The TRI-BRID Drone : A drone designed to operate in multiple mediums
8	Aquatic Power Generators
9	A web portal for PBL students and management that dynamically launches project microsites.
10	A Smart assistive device for disabled people
11	Conceptual Design of An Advanced Ornithopter
12	Hospital Management Website
13	Deep learning based recognition of citrus plant diseases
14	Designing an app for early detection of Alzheimer
15	middleman- A mobile application
16	An electronic module that alerts the end user about the temperature violation of the medicines and edible products
17	Smart Traffic Density Controller
18	Automated Collision Avoidance System
19	Automated Accident Detection and Alert System
20	Development of Energy Consumption Monitoring System with Home Automation Using IoT
21	Cloud based recommendation engine for ebooks portal using K-Nearest, SVD, top- N algorithm deployed in AWS through serverless technology and API Gateway
22	Multi-locomotion System For UGV in Snowy Terrain

Frequently Asked Questions

What is PBL?

PBL is the abbreviation of both Problem Based Learning and Project Based Learning. Problem-based learning involves critical thinking to examine problems that lack a well-defined answer. In project-based learning, students are challenged to develop a plan and create a product or artifact that addresses the problem.

What is Kumaraguru PBL ?

Kumraguru Project Based Learning, PBL in short, is a learning framework introduced in the academic year 2020-21 for the first year B.E./B.Tech. students. The model is drawn from studying the various inquiry-centric learning framework where a top-down approach and a bottom-up approach converge to maximize learning outcomes.

How are students selected for PBL?

A call for screening test for PBL selection is announced. Interested students register and an online aptitude test is conducted during the first phase selection process of Kumaraguru Pro Learn Framework. The short-listed students are invited for a virtual interview. The successful candidates become part of the PBL Framework.

What is Deep Learning of courses?

Deep Learning is a problem-based approach followed to impart basic engineering concepts that are prescribed in the curriculum. The instructor brainstorms about an existing real-world problem related to the subject along with its possible solutions. Then the instructor handholds the candidates in providing viable solutions during which all the related engineering and scientific core concepts are explained inclusive of topics from the curriculum and beyond. The concept of same problem having different solutions and the fact that there is no right answer or wrong answer for any problem are also clearly explained. Subsequently, the students are provided with similar open-ended problems, and they are asked to work towards providing design solutions, which range from simple mathematical models to complex engineering designs.

Do I gain opportunities to do Industry projects?

Certainly. If you have the passion and willingness to learn, then you can be part of an Industry project right from the first year and learn the curricular courses through Deep Learning Mode.

If I join PBL in the first semester, should I continue in the same mode for the higher semesters too?

Not really, Though it is highly recommended and students largely appreciate the learning outcomes of PBL, there is no compulsion to continue in PBL for the higher semester. The student is free to shift to the normal mode in the following semester but not during the middle of the semester.

Should I complete the project that I am pursuing within a semester in PBL?

While it is ideal to complete the project by the end of a semester, the students are encouraged to upscale the project in the following semester if there is a need and a recommendation from the mentors and reviewers. The project team can present their accomplishment at the end of a semester as their Phase I of the project and take it forward to the following semester as Phase II of the Project.

How does PBL help in my placements?

The companies today are largely looking at the skillsets, knowledge and attitude and hence the PBL framework learners certainly have stand a fair chance in placements as they have imbibed the requisite knowledge and skillsets better than normal mode learners.

What are my prospects for Higher Education in foreign universities if I am part of PBL?

Project Based Learning and Problem Based learning are now becoming the order of the day in most of the premier universities across the globe. Hence, pursuing your undergrad degree through PBL framework guarantees enrolment in some of the top-ranking universities.

Do I get guidance for writing research papers and building prototypes?

A dedicated team of faculty members with expertise mentor the PBL learners in research paper writing, building prototypes in the laboratories and guide the learners to also file patent for innovative ideas and designs developed by the learners.

PROJECT BASED LEARNING FRAMEWORK

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