



**An Autonomous Institute**  
**Affiliated to VTU, Belagavi**  
**Approved by AICTE, New Delhi**  
**Recognized by UGC under 2(f) & 12 (B)**

## TINKERING LAB

<b>Course Title</b>	<b>ABILITY ENHANCEMENT COURSE (Tinkering Lab)</b>		
<b>Course Code</b>	MVJ21AEC01	<b>CIE</b>	50 Marks
<b>Total No. of Contact Hours</b>	15 L: T: P:: 0 : 0 : 2	<b>SEE</b>	50 Marks
<b>No. of Contact week</b>	01	<b>Total</b>	100
<b>Credits</b>	01	<b>Exam. Duration</b>	3 hours

<b>Course objective is to:</b>		
<ul style="list-style-type: none"> <li>• To create workspaces that are suitable for young minds to learn innovation skills, develop ideas via hands-on activities, work and learn in a flexible environment.</li> <li>• To empower students with skills of creativity, innovation, critical thinking, design thinking, social and cross-cultural collaboration and ethical leadership.</li> <li>• To help build innovative solutions for unique problems, thereby supporting the nation’s efforts to grow as a knowledge economy.</li> </ul>		
<b>Module-1 Innovation Level-1</b>	<b>RBT Level L1, L2, L3</b>	<b>3 Hrs</b>
<b>Orientation / Training program</b>		
To provide hands on session on various tools of different departments		

<b><u>Evaluation parameters:</u></b>		
1. General Test and Viva Voce for equipment's handling.		
2. Report Submission of Level-1		
<b>Module-2 Innovation Level -2</b>	<b>RBT Level L1, L2, L3</b>	<b>5 Hrs</b>
<b>Foundation Skills for Innovation</b>		
<p><b>Tinker CAD:</b>(a simulation software for a beginner friendly environment that allows students to get used to the innovative tools, which they will use during any phase of innovation. It also helps students to visualize their ideas before train them in real life)</p>		
1.Multidisciplinary ideas to be framed and prototype (clay, thermo Cole, cardboard etc) need to be made		
2.TinkerCAD- we will train the next generation of designers and engineers with the foundational skills for innovation: 3D design, electronics, and coding.		
<b><u>Evaluation parameters:</u></b>		
1. Problem / ideas, Simulation and prototype model		
2. Report Submission of Level-2		
<b>Module-3 Innovation Level – 3 (Third year)</b>	<b>RBT Level L1, L2, L3</b>	<b>7Hrs</b>
<b>Product Development</b>		
<b>1. Developing the prototype model.</b>		
<b>2. 3D printing and design :</b> 3D Modelling of a single components - Assembly of CAD modeled Components - Exercise on CAD Data Exchange - Generation of .stlfiles - Identification of a product for Additive Manufacturing and its process plan - Printing of identified product on an available AM machine - Post processing of additively manufactured product - Inspection and defect analysis of the additively manufactured product - Comparison of Additively manufactured product with conventional manufactured counterpart.		

<b><u>Evaluation parameters:</u></b>	
1. Project evaluation by mentors and domain experts	
2. Showcase the developed products in International and National Events.	
3. Report Submission of Level-3.	
<b>Course outcomes:</b> Students will be able to	
CO1	Understand the ethics in handling the equipment and its safety precautions
CO2	Promote innovative skill set among the young minds
CO3	Develop CAD models for 3D printing
CO4	Select a specific material for the given application
CO5	Understand the innovative product development cycle

<b>Reference Books:</b>	
1.	Materials Science and Engineering, William D. Callister Jr., John Wiley & Sons. Inc, 5th Edition, 2001
2.	Measurement Systems Applications and Design, Ernest O. Doebelin, 5th Ed., McGraw Hill Book Co
3.	"Mechanics of Materials", by R.C.Hibbeler, Prentice Hall. Pearson Edu., 2005
4.	"Manufacturing Technology", Serop Kalpakjian, Steven R. Schmid, Pearson Education Asia, 5th Ed. 2006.
5.	'Machine Drawing with Auto CAD', Goutam Pohit & Goutham Ghosh, 1st Indian print Pearson Education, 2005
6.	Fundamentals of Metal Machining and Machine Tools, G. Boothroyd, McGraw Hill, 2000
7.	"Mechanical workshop practice" by John K.C, PHI Learning Pvt. Ltd., 27-Aug-2010
8.	Workshop Practice 2E. Author. Bawa. Publisher. Tata McGraw-Hill Education, 2009. ISBN. 0070671192, 9780070671195.
9.	Arduino Cookbook: Recipes to Begin, Expand, and Enhance Your Projects by Michael Margolis, Brian Jepsen, et al.   Jun 9, 2020

## Robotics and Industrial Automation lab

<b>Course Title</b>	ABILITY ENHANCEMENT COURSE (Robotics and Industrial Automation lab)		
<b>Course Code</b>	MVJ21AEC02	<b>CIE</b>	50 Marks
<b>Total No. of Contact Hours</b>	15 L: T: P:0 : 0 : 2	<b>SEE</b>	50 Marks
<b>No. of Contact week</b>	01	<b>Total</b>	100
<b>Credits</b>	01	<b>Exam. Duration</b>	3 hours

**Course objectives:** This course will enable students,

- To understand the history, concept development and key components of robotics technologies.
- To understand various CAD and EDA tools for robotic design
- To obtain hands-on experience in design and manufacture of basic robots
- To familiarize with FDM 3D printing for model design
- To familiarize with Circuit design software for PCB layout design

**Module-1**

**RBT Level**  
**L1, L2, L3**

**3Hrs**

**Introduction:** Introduction to Robotics, Microcontrollers, Drives for robots: Electric, hydraulic, and pneumatic. Sensors: Internal-External, Contact non-contact, position, velocity, force, torque, proximity and range, Actuators, Additive manufacturing.

**Module-2**

**RBT Level**  
**L1, L2, L3**

**7Hrs**

**Modelling and interface:** Microcontroller interface with IDE and sensors, interfacing with actuators, chassis design and modelling, interfacing circuit design using EDA tools

**Evaluation criteria:** 3D modelling for Robot chassis, Circuit design for interface of components

**Module-3**

**RBT Level**  
**L1, L2, L3**

**5 Hrs**

Developing and building a robot: Models of flexible links and joints, Robotic arm – Components and structure, Types of joints and workspace, Design models for mechanic arms and lifting systems using Cprog tool	
<b>Evaluation criteria: Design robots for various applications, submission of report and product.</b>	
<b>Course outcomes:</b> Students will be able to	
CO1	Explain the fundamentals of robotics and its components
CO2	Illustrate the Kinematics and Dynamics of robotics
CO3	Elucidate the need and implementation of related Instrumentation & control in robotics
CO4	Select the right material handling system for a given application
CO5	Develop multidisciplinary robotics projects, Increase students' ability, competency and teamwork skills on dealing with real-life engineering problems

<b>Reference Books:</b>	
1	Arduino Programming: 2 books in 1 - The Ultimate Beginner's & Intermediate Guide to Learn Arduino Programming Step by Step, Ryan Turner
2	Sensors and Transducers, Patranabis D
3	Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Ian Gibson, David Rosen. Brent Stucker, 2nd ed. 2015 Publisher-Springer Nature
4	PCB Design and Layout Fundamentals for EMC, Roger Hu, 22 November 2019

## UAV LAB

<b>Course Title</b>	ABILITY ENHANCEMENT COURSE (UAV Lab)		
<b>Course Code</b>	MVJ21AEC03	<b>CIE</b>	50 Marks
<b>Total No. of Contact Hours</b>	15 L: T: P::0 :0 : 2	<b>SEE</b>	50 Marks
<b>No. of Contact week</b>	01	<b>Total</b>	100
<b>Credits</b>	01	<b>Exam. Duration</b>	3 hours

### Course objective is to:

- Make the learner, to select and integrate the elements as remotely piloted aerial vehicle based on the given requirements
- Make the learner, to integrate the autopilot with other essential subsystems and to work with the ground control station effectively.
- Make the learner to familiarize with the integration of different sensors with flight controller

<b>Module-1 Development of Remotely Piloted Aerial Vehicles</b>	<b>RBT Level L1, L2, L3</b>	<b>5 Hrs</b>
Introduction and essential elements, Functioning of Drone, Requirement Analysis, Airframe Selection, Power Rating, Motor and Propeller Selection, Integration, Calibration		
<b>Module-2 Development of Autonomous Unmanned Aerial Systems</b>	<b>RBT Level L1, L2, L3</b>	<b>5 Hrs</b>
Flight Controller Pin Assignment, System Integration, Configuration, First Flight Settings, Mission Planning, Diagnostics with Mission Logs		
<b>Module-3 Sensor Integration with Flight Controllers and Applications</b>	<b>RBT Level L1, L2, L3</b>	<b>5 Hrs</b>

Essential Payloads for Autonomous Mission , Gimbal / Camera, Video Transmission, Aerial Mapping, Agricultural Applications, IMU and Optical Sensor	
<b>Course outcomes:</b> Students will be able to	
CO1	Apply the knowledge of selection of the system
CO2	Describe the design concepts of UAVs’
CO3	Understand the issues and challenges of control and stability of different types of UAVs’
CO4	Understand the role of different sensors and autonomy in control and stability of UAV systems
CO5	Apply the knowledge of payload control
<b>Evaluation Parameters:</b>	
<ol style="list-style-type: none"> <li>1. Equipment Handling</li> <li>2. Viva-Voce</li> <li>3. Report Submission</li> </ol>	
<b>Reference Books:</b>	
1.	John Baichtal, “BUILDING YOUR OWN DRONES - A Beginner’s Guide to Drones, UAVs, and ROVs”, Que Publishing, 1 <sup>st</sup> Edition, 2016, USA.
2.	Reg Austin, “Unmanned Air Systems: UAV Design, Development and Deployment”, Wiley Publishing, 1 <sup>st</sup> Edition, 2010.
3	Copter documentation – ArduPilot, Archived: PDF Guide, Archived: PDF Guides — Copter documentation (ardupilot.org).

## NI LABVIEW

Course Title	ABILITY ENHANCEMENT COURSE		
	(NI LabVIEW)		
Course Code	MVJ21AEC04	CIE	50 Marks
Total No. of Contact Hours	15L: T: P: 0:0: 2	SEE	50 Marks
No. of Contact week	01	Total	100
Credits	01	Exam. Duration	3 hours

<p><b>Course objective is to:</b></p> <ul style="list-style-type: none"> <li>• Introduce the basics of LabVIEW environment and the concept of Data Flow programming</li> <li>• Familiarize the common LabVIEW architectures.</li> <li>• Familiarize the graphs and charts available in LabVIEW</li> <li>• Handle errors</li> </ul>		
<b>Module-1 Introduction to LabVIEW</b>	<b>RBT Level L1, L2, L3</b>	<b>3 Hrs</b>
<p>Introduction to Virtual Instrumentation, LabVIEW Programming and its advantages.</p> <p><b>LabVIEW Environment:</b> Front Panel, controls Palette, controls and indicators, Block diagram, terminals, controls, indicators and constants, Block diagram nodes, functions palette, searching for controls, Vis and functions.</p> <p><b>Dataflow Programming:</b> Wires, automatically wiring objects, Manually wiring objects</p>		
<b>Module-2 Data Structures and tools</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
<p><b>Data Structures:</b> String, Numeric, Boolean, Dynamic, Arrays, Clusters</p> <p><b>Tools:</b> Selecting a tool, Shortcut menus, Property dialog boxes, front panel window toolbar, Block diagram window toolbar</p> <p><b>Debugging tools:</b> Fixing broken Vis, finding causes for broken Vis, common causes of broken Vis, fixing incorrect behavior, block diagram toolbar, probe tool</p>		
<b>Module-3 Execution Structures</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
<p><b>Loops –</b> While, infinite, for, Case Structures</p> <p><b>Passing data between loop iterations:</b> Shift registers, initializing shift registers and stacked shift registers.</p>		
<b>Module-4 Introduction to Graphs and Charts</b>	<b>RBT Level</b>	



	<b>L1, L2, L3</b>	<b>3Hrs</b>
Waveform graphs and charts, XY graphs, Intensity graphs and charts, Digital waveform graphs, Mixed signal graphs, 2D graphs, 3D graphs		
<b>Module-5 Handling errors</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
Automatic error handling, Manual error handling, error clusters.		
<b>Course outcomes:</b> Students will be able to		
CO1	Apply knowledge to understand various controls & indicators, arrays, strings, loops, clusters and various debugging tools in LabVIEW.	
CO2	Understand data structures and implement VIs using arrays, strings, loops and clusters.	
CO3	Understand and use loop structures of LabVIEW	
CO4	Create user interfaces with charts and graphs in LabVIEW	
CO5	Implement error handling techniques in LabVIEW	

<b>Reference Books:</b>	
1.	LabVIEW for Everyone: Graphical Programming Made Easy and Fun Hardcover – 27 July 2006, Jeffrey Travis (Author), Jim Kring (Author) Prentice Hall; 3rd edition (27 July 2006), ISBN-13: 978-0131856721
2.	Hands-On Introduction to LabVIEW for Scientists and Engineers, English, Paperback, Essick John, Oxford University Press Inc ISBN: 9780190853068, 9780190853068, Edition: 2018.

## **CNC LAB**

<b>Course Title</b>	<b>ABILITY ENHANCEMENT COURSE (CNC LAB)</b>		
<b>Course Code</b>	MVJ21AEC05	<b>CIE</b>	50 Marks
<b>Total No. of Contact Hours</b>	15 L: T: P:: 0 : 0 : 2	<b>SEE</b>	50 Marks
<b>No. of Contact week</b>	01	<b>Total</b>	100
<b>Credits</b>	01	<b>Exam. Duration</b>	3 hours

<b>Course objective is to:</b>		
<ul style="list-style-type: none"> <li>• Understand the working principle of the CNC Machines.</li> <li>• Understand the driving characteristics of the driving system, feedback devices and the application of CNC Machines.</li> <li>• Understand the dimension system and structure of the CNC Part Program.</li> <li>• Understand the G Codes and M Codes and other functions of a CNC Part Program</li> <li>• Understand the flow of the CAM system, and the characteristics of the process Tool Motion</li> <li>• Understand the characteristics of the process data transmission in the CAM System.</li> </ul>		
<b>Module-1 : CNC Turning</b>	<b>RBT Level L1, L2, L3</b>	<b>7Hrs</b>
<p>Introduction to the basic programming skills of CNC turning center, Understanding of the basic structure of the CNC Part Program, Parts of a CNC Lathe Machine, Benefits of CNC Turning, Difference Between NC and CNC Machines, CNC Turning Process, understanding of the working principle of the CNC Machines, driving characteristics of the drive system, feedback devices and the application of CNC Machines, dimension system and structure of the CNC Part Program.</p> <p><b>Lab Exercises:</b> To develop a program involving step turning and taper turning.</p>		
<b>Module-2 CNC Milling &amp; Robot Programming</b>	<b>RBT Level L1, L2, L3</b>	<b>8 Hrs</b>
<p>Introduction to the basic programming skills of CNC Milling Center, Program a CNC Machine to a basic level, understanding of G Codes and M Codes and other functions of a CNC Part Program, flow of the CAM system, characteristics of the process, Tool Motion characteristics, process of the data transmission in the CAM System. Introduction to types of Robot configuration and degrees of freedom, Develop the Programming code for 6 axis Robot arm for pick and place operations.</p> <p><b>Lab Exercises:</b> To develop three programs involving milling and drilling operations.</p>		
<b>Course outcomes:</b> Students will be able to		
CO1	Understand the fundamentals of CNC Machine, part loading and initialization of coordinate system.	

CO2	Develop the dimension system and structure of the CNC Part Program for parts.
CO3	Develop the G Codes and M Codes and other functions of a CNC Part Program for new parts and products
CO4	Apply the flow of the CAM system, and the characteristics of the process Tool Motion.
CO5	Develop the basic of robotics usage and programming the 6-axis robot

<b>Reference Books:</b>	
1	CAD/CAM Principles and Applications by P N Rao, Mc Graw Hill Publications
2	Mastering CAD /CAM by Ibrahim Zeid, Mc Graw Hill Publications
3	Automation, Production Systems, and Computer –Integrated Manufacturing by Mikell P. Groover
4	Computer Control of Manufacturing Systems - YoramKoren.

## IOT LAB

<b>Course Title</b>	ABILITY ENHANCEMENT COURSE (IOT LAB)		
<b>Course Code</b>	MVJ21AEC06	<b>CIE</b>	50 Marks
<b>Total No. of Contact Hours</b>	15 L: T: P::0:0: 2	<b>SEE</b>	50 Marks
<b>No. of Contact week</b>	01	<b>Total</b>	100
<b>Credits</b>	01	<b>Exam. Duration</b>	3 hours

### Course objective is to:

- Gain knowledge on IoT ecosystem and Arduino board.
- Interface Bluetooth, LED and OLED to Arduino board.
- Interface IR, Temperature, humidity sensors to Arduino board.
- Implement protocols MQTT, TCP, UDP

<b>Module-1 Introduction to IoT</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
<p><b>Introduction to IoT:</b> IOT Challenges, Network Architecture and Design- Drivers Behind New Network Architectures, Security, IOT Reference Model, Simplified IOT Architecture.</p> <p>1.To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when ‘1’/’0’ is received from smart phone using Bluetooth.</p> <p>2. To interface Digital sensor (IR) with Arduino and write a program to turn ON LED when the push button is pressed or a sensor detection.</p>		
<b>Module-2 IoT Layers and functionality</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
<p><b>1.IOT Network Architecture and Design Core IOT Functional Stack, Layer.</b></p> <p>2. Write a program on Arduino/ Raspberry Pi to subscribe to MQTT broker for proximity data taken from proximity sensor and print it.</p> <p>3. Write a program to create TCP server on Arduino / Raspberry Pi and respond with air quality data to TCP client when requested using air quality sensor.</p>		
<b>Module-3 Data Collection, Storage and Computing using a Cloud Platform:</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
<p><b>Data Collection, Storage and Computing using a Cloud Platform:</b> Introduction, Cloud computing paradigm for data collection, storage and computing, Cloud service models, IoT Cloud - based data collection.</p> <p>1. Implement a smart Irrigation system for Soil analysis and fertilizer prediction using smart phone.</p> <p>2. Write a program on Arduino to retrieve temperature and humidity data from things board cloud.</p>		
<b>Module-4 Lab Experiments</b>	<b>RBT Level L4, L5</b>	<b>3Hrs</b>
<p>1. To interface motor using relay with Arduino and write a program to turn ON motor when push button is pressed.</p> <p>2. Interfacing LCD Display with Raspberry Pi /ARM 7 to display “Hello World”.</p> <p>3. Registration of Gateway and creating application in Network Server.</p>		

4. Write a program on Arduino / Raspberry Pi to subscribe to MQTT broker for proximity data taken from proximity sensor and print it.
5. Write a program for fire detection using buzzers integrating smoke detectors with Arduino / Raspberry Pi.

<b>Module – 5 Implementation</b>	<b>RBT Level</b> <b>L4, L5</b>	<b>3Hrs</b>
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1. Develop IOT based smart street light system using Arduino / Raspberry Pi.
2. Illustrate remote healthcare monitoring with android interface and transferring patient’s data over WSN.
3. Develop Smart Monitoring and Controlling of Appliances Using, Arduino / Raspberry Pi
4. Demonstrate an anti-theft system using magnetic sensors and alarms.

**Course outcomes:** Students will be able to

CO1	Analyze different IOT Architecture and select them for a particular application.
CO2	Evaluate the sensor data generated and map it to IOT protocol stack.
CO3	Implement and execute programs using development tools.
CO4	Develop an energy efficient system for WSN.
CO5	Create a real life application involving Wireless Sensor Networks using IoT concepts.

<b>Reference Books:</b>	
1.	Cisco, IOT Fundamentals – Networking Technologies, Protocols, Use Cases for IOT, Pearson Education; First edition (16 August 2017). ISBN-10: 9386873745, ISBN-13: 978-9386873743
2.	Raj Kamal, "Internet of Things-Architecture and design principles", McGraw Hill Education.
3.	ArshdeepBahga and Vijay Madisetti, 'Internet of Things – A Hands on Approach', Orient Blackswan Private Limited - New Delhi; First edition (2015), ISBN-10: 8173719543, ISBN-13: 978-8173719547

## ASTRONOMY CLUB

Course Title	ABILITY ENHANCEMENT COURSE (Astronomy Club)		
Course Code	MVJ21AEC07	CIE	50 Marks
Total No. of Contact Hours	15L: T: P:: 0 : 0 : 2	SEE	50 Marks
No. of Contact week	01	Total	100
Credits	01	Exam. Duration	3 hours

### Course objective is to:

- To create workspaces that are suitable for young minds to learn innovation skills, develop ideas via hands-on activities, work and learn in a flexible environment.
- To empower students with skills of creativity, innovation, critical thinking, design thinking, social and cross-cultural collaboration and ethical leadership.
- To help build innovative solutions for unique problems, thereby supporting the nation's efforts to grow as a knowledge economy.

Module-1	RBT Level L1, L2, L3	4 Hrs
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### Innovation Level-1

#### Orientation / Training program

To enhance the knowledge on introduction to the Big Bang Theory, Galaxies, Stars, Electromagnetic Spectrum, Space Communication, Types of telescopes.

#### Evaluation parameters:

1. General Test and Viva Voce for telescopes.
2. Report Submission of Level-1

<b>Module-2</b>	<b>RBT Level L1, L2, L3</b>	<b>5 Hrs</b>
<p><b>Innovation Level -2</b></p> <p><b>Foundation Skills for Innovation</b></p> <p><b>Optical Telescope:</b></p> <p>Theoretical working principle of optical telescope. Elementary geometrical optics, refractive index; reflection and refraction at a plane boundary; total internal reflection. Image formation by reflection at a spherical boundary; concave and convex mirrors. Real and virtual images. Magnification. Image formation by refraction at a spherical boundary and by converging and diverging thin lenses.</p> <p><b><u>Evaluation parameters:</u></b></p> <ol style="list-style-type: none"> <li>1. Problem / ideas</li> <li>2. Report Submission of Level-2</li> </ol>		
<b>Module-3</b>	<b>RBT Level L1, L2, L3</b>	<b>6 Hrs</b>
<p><b>Innovation Level – 3</b></p> <p><b>Product Development</b></p> <p>Fabrication of small optical telescope (Reflective telescope, materials, measurements, lens Etc...)</p> <p><b><u>Evaluation parameters:</u></b></p> <ol style="list-style-type: none"> <li>1. Project evaluation by mentors and domain experts</li> <li>2. Showcase the developed products in International and National Events.</li> <li>3. Report Submission of Level-3.</li> </ol>		
<b>Course outcomes:</b>		
CO1	Apply basic physical principles from a broad range of topics in physics to astronomical situations	

CO2	Demonstrate knowledge of the basic laws of physics that pertain to the study of the bodies of the solar system
CO3	Adequate knowledge to select the specific material for the telescope
CO4	Understand the innovative product development cycle of optical Telescope
CO5	Promote innovative skill set among the young minds

<b>Reference Books:</b>	
1.	Optics and Optical Instruments (Dover Books on Physics) 28 march 2003, by B.K Johnson.
2.	Laboratory Exercises for Introductory Radio Astronomy with a Small Radio Telescope Paperback – Import, 10 December 2008 by Laura A Whitlock (Author), Kiley Pulliam (Author).
3.	An Introduction to Astronomy Hardcover – 1 January 2018 by Forest Ray Moulton.
4.	Astronomy For Beginners: The Introduction Guide to Space, Cosmos, Galaxies and Celestial Bodies Paperback – 8 October 2020.

## **Software Development Lab/Club**

<b>Course Title</b>	<b>ABILITY ENHANCEMENT COURSE (Software Development Lab/Club)</b>		
<b>Course Code</b>	MVJ21AEC08	<b>CIE</b>	50 Marks
<b>Total No. of Contact Hours</b>	15 L: T: P:: 0:0: 2	<b>SEE</b>	50 Marks
<b>No. of Contact week</b>	01	<b>Total</b>	100
<b>Credits</b>	01	<b>Exam. Duration</b>	3 hours



<b>Course objective is to:</b>		
<ul style="list-style-type: none"> <li>• Formulating the ideas for the real time problems</li> <li>• Depicting their ideas using design tools</li> <li>• Identifying the problem solving techniques</li> <li>• Role of programming within the overall software development process</li> <li>• Develop the capability for self-learning</li> <li>• Encourage the students to work as an individual or as team</li> </ul>		
<b>Module-1</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
Introduction to Software Development process and Roles in the IT Industry, Hands on training on MS-Office: MS-Excel, MS-Power point		
<b>Module 2</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
Introduction to Web -Technologies -Basics of HTML5, CSS3, JavaScript Introduction to Bootstrap 5 - JavaScript DOM Operations (Front-End) - Mini Project-1		
<b>Module-3</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
Introduction to Back-end -Basics of PHP & SQL, G-Mail SMPT Server , Basics of UI/UX, Mini Project-2(Back-End)		
<b>Module 4</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
Introduction to various Deep learning algorithms (NLP, DIP etc),Designing and implementing various ML/DL algorithms in a range of real-world applications		
<b>Module 5</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
Assessment – implementation and connectivity Final Project		
<b>Course outcomes:</b> Students will be able to		

CO1	Describe the elements of a basic software development process and illustrate the variety of different life cycles
CO2	Apply information technology principles and practices to real-world solutions
CO3	Develop a dynamic webpage by the use of java script and HTML
CO4	Analyze and evaluate websites from a usability and accessibility perspective
CO5	Demonstrate employability skills and a commitment to professionalism

<b>Reference Books:</b>	
1.	Online resource materials, Open-Source Software
2.	Randy Connolly, Ricardo Hoar, "Fundamentals of Web development", 1 <sup>st</sup> Edition, Pearson Education India. (ISBN:978-9332575271)
3	Wilbert O. Galitz, "The Essential Guide to User Interface Design", John Wiley & Sons, Second Edition 2002.
4	Introduction to Machine Learning with Python: A Guide for Data Scientists Book by Andreas C. Müller and Sarah Guido

## **IDEA BOX**

Course Title	ABILITY ENHANCEMENT COURSE		
	<b>(Idea Box)</b>		
Course Code	MVJ21AEC09	<b>CIE</b>	50 Marks
Total No. of Contact Hours	15L: T: P:: 0 : 0 : 2	<b>SEE</b>	50 Marks
No. of Contact week	01	<b>Total</b>	100
<b>Credits</b>	01	<b>Exam. Duration</b>	3hours

### **Course objective is to:**

- To develop conceptual thinking skills to generate ideas and content to solve problems or create opportunities.

- To develop a research and workspace practice through inquiry and iteration.
- To develop critical thinking skills that will allow them to analyse and position their work.
- To develop collaboration skills to work in a team or group actively and effectively.

<b>Module-1</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
<b>Perspective on how ideas are developed:</b> Discover how entrepreneurs come up with ideas and the processes they use to bring innovative ideas to market; Activity-On Developing Ideas		
<b>Module-2</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
<b>Types of innovation</b> Understand the various innovation typologies based on different dimensions of the innovation space		
<b>Module-3</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
<b>Uncertainty and decision making</b> Gain an understanding of uncertainty and how it influences strategic decision making		
<b>Module-4</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
<b>Discovery strategies</b> Learn about the practice of navigating uncertainty to discover new strategies to establish and grow innovation in a corporate setting		
<b>Module-5</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
<b>Knowledge and resources</b> Appreciate the role resources and capabilities play in the identification of innovative ideas		

<b>Innovation evaluation and selection</b>	
Discover strategies for assessing the feasibility of ideas	
<b>Course outcomes:</b> Students will be able to	
CO1	Demonstrate practical idea generation and work effectively in a team.
CO2	Design appropriate primary and secondary market, competition and customer research.
CO3	Generate, develop and pitch innovative new venture ideas
CO4	Assess the practicality of creative ideas.
CO5	Promote the business opportunity to potential stakeholders

<b>Reference Books:</b>	
1.	Cracking Creativity by Michael Michalko
2.	Steal like an Artist by Austin Kleon
3.	IdeaSpotting: How to Find Your Next Great Idea by Sam Harrison

## Tomorrow's Engineers Club

Course Title	ABILITY ENHANCEMENT COURSE (Tomorrows Engineers Club)		
Course Code	MVJ21AEC10	<b>CIE</b>	50Marks
Total No. of Contact Hours	15L: T: P:: 0: 0 : 2	<b>SEE</b>	50Marks
No. of Contact week	01	<b>Total</b>	100
<b>Credits</b>	01	<b>Exam. Duration</b>	3hours

<p>This course will enable students to,</p> <ul style="list-style-type: none"> <li>• To take up Engineering as a team sport.</li> <li>• To get involved with fellow students and give solutions for community defined problems.</li> <li>• To think out of the box and discover new areas of interest.</li> <li>• To network with industry professionals.</li> <li>• To make students highly successful inside and outside the classroom.</li> </ul>		
<b>Module – 1 Engineering</b>	<b>RBT Level L1, L2, L3</b>	<b>4Hrs</b>
<p>What is Engineering? What does an engineer do?, Main branches of engineering - Chemical engineering, Civil engineering, Electrical engineering, Mechanical engineering, Bioengineering, Interdisciplinary engineering - Aerospace engineering, Marine engineering, Computer engineering, Methodology, Methodology, Problem solving, Computer usage, Social context, Code of ethics</p>		
<b>Module-2 Engineering - Relationships with other disciplines</b>	<b>RBT Level L1, L2, L3</b>	<b>2Hrs</b>
<p>Science, Medicine and biology, Art, Business, Political engineering, Marketing engineering, Social engineering, Financial Engineering, Attributes of an Engineer</p>		
<b>Module- 3 Issue Analysis and Identification</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
<p>Root causes analysis, Visioning exercise - What do we want our society/country to be like?, What specific features would act as indicators for our ideal society?, What needs to be changed for this to be achieved?, What are the obstacles that stop this happening?, Issue selection, Workout Session</p>		
<b>Module-4 Importance of Creativity &amp; Innovation in Problem Solving</b>	<b>RBT Level L1, L2, L3</b>	<b>3 Hrs</b>
<p>Why are soft skills important? What is creativity?, Why is creativity important? , What is creative problem-solving?, How to improve your creative problem-solving skills, Creativity in leadership,</p>		

Within team dynamics, Encouraging creativity, Innovation in Problem Solving - Framing, Diagnosing, Generating Solutions, Making Choices		
<b>Module-5 Idea to Product/Prototype</b>	<b>RBT Level L1, L2, L3</b>	<b>3 Hrs</b>
Stories behind some of most important, useful inventions in human history, Great Inventions from India, Case studies: From Idea to Product Launch: The Story Behind TheDrawBag.com		
<b>Course outcomes:</b> Students will be able to		
CO1	Understand the key concepts of Creative Thinking, Innovation and Problem-Solving	
CO2	Apply appropriate problem-solving frame work methodology	
CO3	Develop the interpersonal skills required for effective performance in group situations	
CO4	Implement a solution in a manner that addresses thoroughly in multiple contextual factors of the problem	
CO5	Describe the roles and responsibilities of key stakeholders	

<b>Reference Books:</b>	
1.	The Goal: A Process of Ongoing Improvement, Author: Eliyahu Goldratt
2.	The Design of Everyday Things, Author: Donald Norman
3.	Engineering in the Mind's Eye, Author: Eugene Ferguson
4	Unwritten Laws of Engineering: With Revisions and Additions, Author: W. J. King
5	She Engineers: Outsmart Bias, Unlock your Potential, and Create the Engineering Career of your Dreams, Author: Stephanie Slocum
6	The Seven Habits of Highly Effective People, Author: Stephen Covey
7	The War of Art: Break Through the Blocks and Win Your Inner Creative Battles, Author: Steven Pressfield, Cracking Creativity by Michael Michalko

# FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

Course Title	ABILITY ENHANCEMENT COURSE (FSIPD)		
Course Code	MVJ21AEC11	<b>CIE</b>	50Marks
Total No. of Contact Hours	15L: T: P:: 0 : 0 : 2	<b>SEE</b>	50Marks
No. of Contact week	01	<b>Total</b>	100
<b>Credits</b>	01	<b>Exam. Duration</b>	3hours

<p><b>Course objective is to:</b></p> <ul style="list-style-type: none"> <li>• To understand the global trends and development methodologies of various types of products and services</li> <li>• To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics, and mechanical systems</li> <li>• To understand requirement engineering and know how to collect, analyse, and arrive at requirements for new product development and convert them into design specification</li> <li>• To understand system modelling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics</li> </ul>		
<b>Module-1</b>	<b>RBT Level</b> <b>L1, L2, L3</b>	<b>3Hrs</b>
<p><b>Fundamentals of Product Development:</b> - Introduction to Product Development Methodologies and Management – Overview of Products and Services – Types of Product Development – Overview of Product Development methodologies – Product Life Cycle – Product Development Planning and Management.</p> <p><b>Activity:</b> - Identify a product from the market and prepare a review on the development of the product.</p>		

<b>Module-2</b>	<b>RBT Level L1, L2, L3</b>	<b>3Hrs</b>
<p><b>Requirements Engineering:</b> -Requirement Engineering – Types of Requirements – Requirement Engineering -traceability Matrix and Analysis – Requirement Management.</p> <p><b>Activity:</b> -Identify a product from the market and prepare a write up on the requirements of the product.</p>		
<b>Module-3</b>	<b>RBT Level L1, L2, L3</b>	<b>3 Hrs</b>
<p><b>Systems Engineering:</b> -System Design and Modelling -Introduction to System Modelling – System Optimization – System Specification – Sub-System Design – Interface Design.</p> <p><b>Activity:</b> - For a product already available in market, design a new model as per your imagination.</p>		
<b>Module-4</b>	<b>RBT Level L1, L2, L3</b>	<b>3 Hrs</b>
<p><b>Conceptualization</b> – Industrial Design and User Interface Design – Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines – Concept Screening and Evaluation – Detailed Design – Component Design and Verification -Mechanical, Electronics and Software Subsystems – High Level Design/Low Level Design of S/W Program</p> <p><b>Activity:</b> - Based on the previous activity of new model design list out the concepts and challenges involved during the product design.</p>		
<b>Module-5</b>	<b>RBT Level L1, L2, L3</b>	<b>3 Hrs</b>
<p><b>Testing:</b> -S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – Types of Prototypes- Prototyping – Introduction to Rapid Prototyping and Rapid Manufacturing – System Integration, Testing, Certification and Documentation</p>		



<b>Activity:</b> - Choose a product in the market and prepare a write up of the testing involved before and after the launch of that product.	
<b>Course outcomes:</b> Students will be able to	
CO1	Define, formulate and analyze a problem in context to business model.
CO2	Interpret the fundamentals in design and development of a new product
CO3	Explain the use of requirements elicitation techniques and their relevance to business situations
CO4	Apply the principles of product architecture and industrial design to design and develop new products
CO5	Acquire knowledge in project management practices in the development of new product

<b>Reference Books:</b>	
1.	Karl T Ulrich and Stephen D Eppinger, “Product Design and Development”, Tata McGraw Hill, Fifth Edition, 2011.
2.	John W Newstorm and Keith Davis, “Organizational Behavior”, Tata McGraw Hill, Eleventh Edition, 2005.