Innovations by the Faculty in Teaching and Learning

Goals of Innovation

The practice of effective and meaningful teaching can benefit immensely when educators thoughtfully experiment and apply new or different pedagogical approaches, technologies, curricular enhancement, course design and organization, and assessments. Classroom and course management innovations, including new ways of teaching that promote student engagement, reorganization of a course(s) that improves students' ability to apply what they learn, course. content that clarifies historical changes in theory, novel assignments that le.ad to increased student engagement. student publications. and/or activities that bring Students from diverse backgrounds together. Faculty members handling the subjects with new innovative methods as shown in the figure 5.1 in the class room to improve the creative ideas from the students.

Appropriate Methods, Significance of Results and Effective Presentation:

We are categorizing Innovation in Teaching Learning process into three aspects as follows.

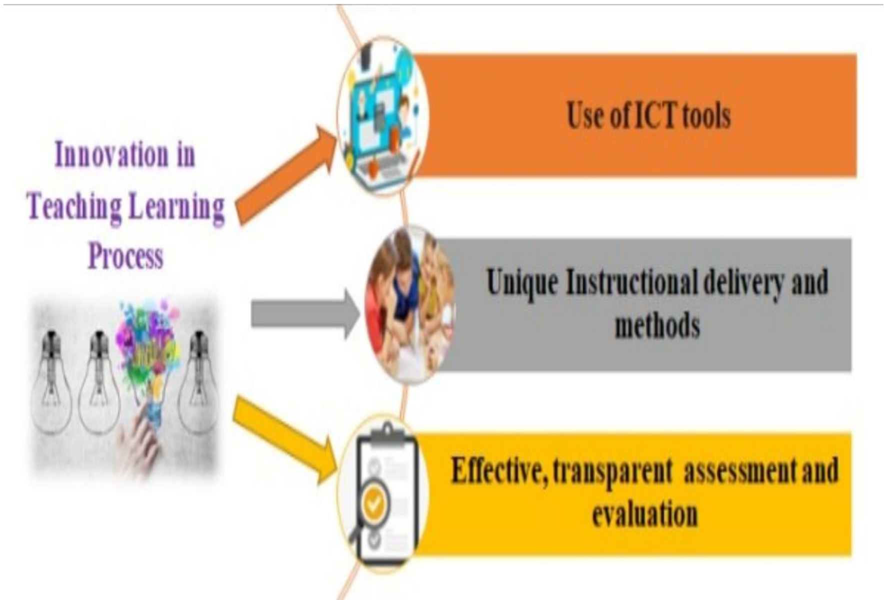


Fig. 5.1: Categories in Innovative Teaching

USE OF ICT TOOLS:

Information communication Technology tools helps a teacher and an institution to stand unique. Use of such ICT tools helps a faculty member to engage future generation students in effective learning and enables learning beyond classroom. Use of ICT tools are practiced in our department through following aspects as shown in the figure 5.2

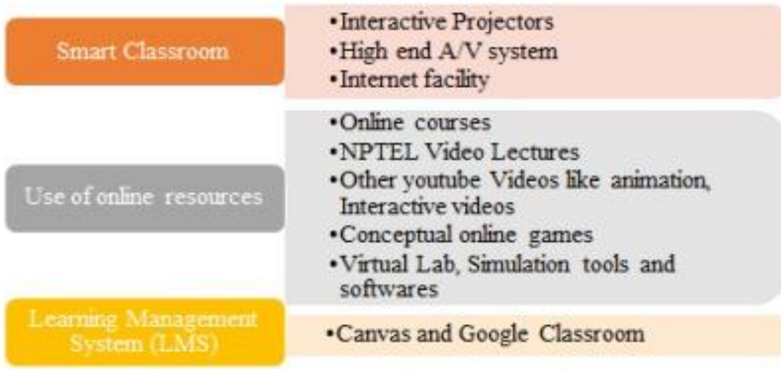


Fig. 5.2: Various ICT Tools

Smart Classroom:

Every classroom at our institute is equipped with interactive projector, A/V system with internet facility. Classrooms facilitate the instructor and students to use both ICT tools enabled learning and conventional chalk-talk learning.

Fig. 5.2.1: Snapshot of smart classroom

Use of Online resources:

All the faculty members are encouraged to use online resources to improve teaching learning process. All faculty members have practice of pursuing an online course every semester related to the course which makes them to be updated. This helps the faculty members to be well prepared for lectures. Use of NPTEL videos, conceptual videos, interactive videos and conceptual online games strengthens and adds value to our teaching learning process.

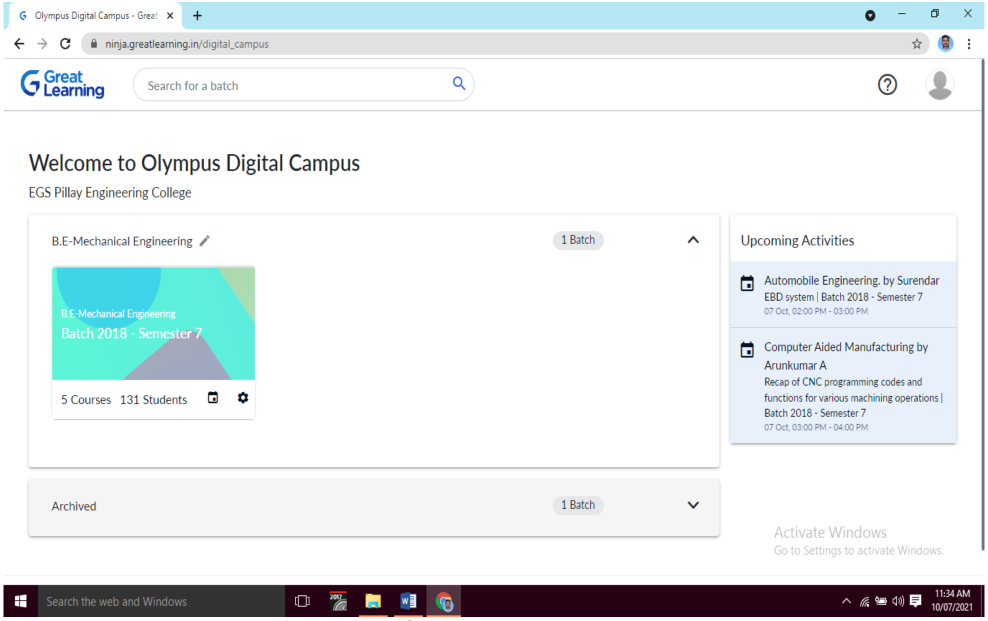


Fig. 5.2.2: Snapshot of online resources (Great Learning)

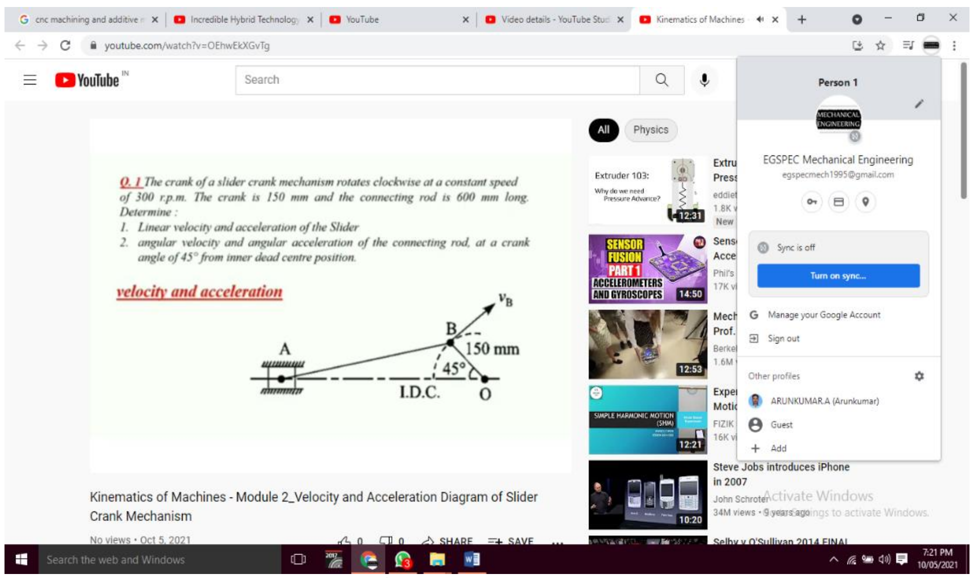


Fig. 5.2.3: Snapshot of online resources (YouTube Link)

Learning Management System (LMS):

Encouraging the students to learn beyond classroom environment is achieved in our department by using Learning Management System (LMS). Google classroom is created for all the courses through which the students can access to learning resources at any time. Use of virtual lab, simulation tools and software make the students to get insight knowledge on the subject.

Fig. 5.2.4: Snapshot of student certificate through LMS (Virtual Lab)

UNIQUE INSTRUCTIONAL DELIVERY AND METHODS:

Mix of instructional delivery and methods keeps the students to be engaged inside the classroom. We the faculty members in the Department of Mechanical Engineering use three modes of instructional delivery and methods as shown in figure 5.3.

Fig. 5.3: Instructional Delivery Methods

Active Learning:

Active learning is a mode of lecture delivery through which the attention span of students is prolonged. This is achieved by methods like Think Pair Share (TPS), Activity based learning, Brain Storming, Case Studies, Incidental Learning, etc.

Fig. 5.3.1: Snapshot of Activity based learning

Passive Learning:

Passive learning mode is the conventional way of teaching which is done through chalk and talk.

Fig. 5.3.2: Snapshot of conventional way of teaching (Chalk and Talk)

Collaborative Learning:

Collaborative Learning is a mode in which students learn through collaboration with their peers. Collaborative learning is executer through Flipped Classroom, Group Discussion, Team Assisted Individualization, Reflective Journal Activity, Field Visits, etc.

Fig. 5.3.3: Snapshot of Group Discussions

EFFECTIVE, TRANSPARENT ASSESSMENT AND EVALUATION:

Transparent evaluation in the course is brought in through use of rubrics for assignments, conduct of online quizzes through Google forms, preparation of answer key for internal assessment tests that is listed in the below figure 5.4

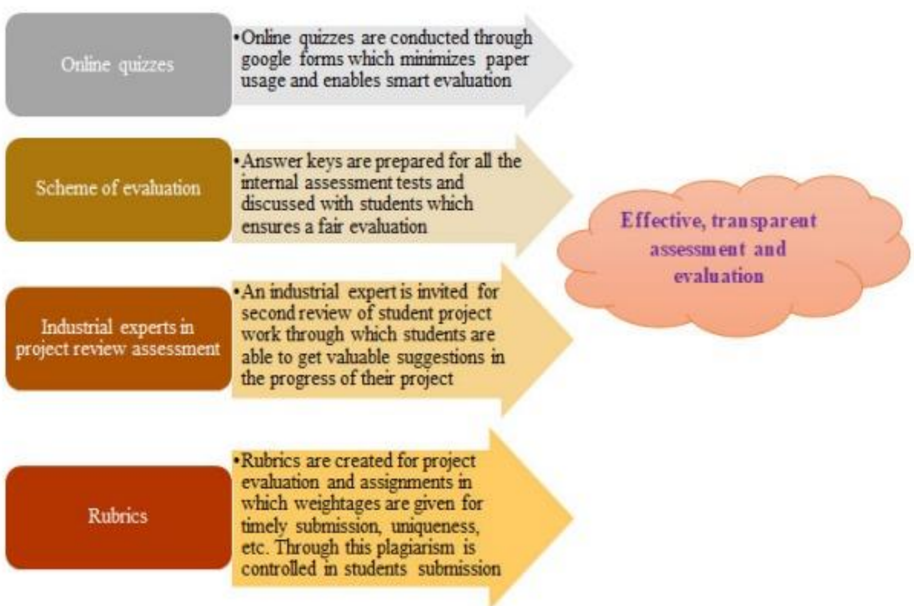


Fig. 5.4: Various Assessment and Evaluation Methods

Great Learning:

Great Learning offers online, career-relevant programs from world-class universities in full stack web development, data science, cloud computing, digital marketing, design, and cybersecurity. Great Learning was created in 2013 with the aim of making current professionals future proof, and to help people gain practical skills in an ever-expanding field. Great Learning students receive weekly mentorship sessions with industry experts, hands-on experience with industry-relevant projects, and small class sizes.

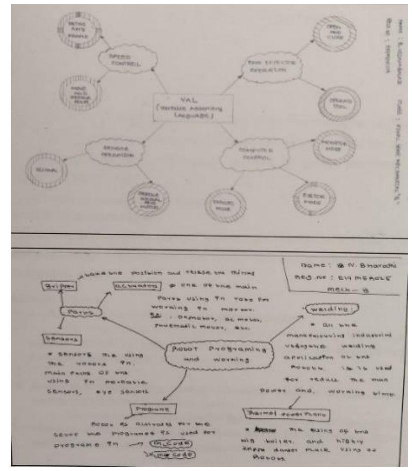
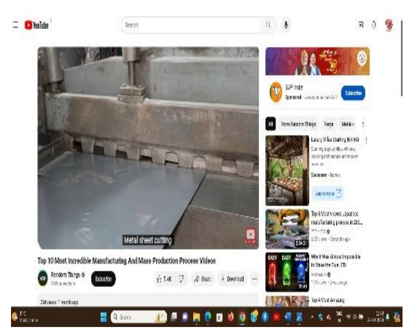
Great Learning courses are aimed at career-changers and those looking to up skill. Applicants need to submit an online application to be considered for acceptance into the program.

Great Learning has an extensive placement assistance program. Students receive career support with 1:1 career mentoring, networking, hackathons, mock interviews, portfolio-building, and LinkedIn and resume review. Thousands of Great Learning students have achieved successful career progression at leading companies, such as Microsoft, Amazon, Adobe, American Express, Deloitte, IBM, Accenture, McKinsey and more.

Peer Review and Critiques for Innovative Teaching Methods

- ✓ Automobile Engineering
  https://www.youtube.com/watch?v=9fm0tpB-Keg
- ✓ Kinematics of Machines
  https://www.youtube.com/watch?v=OEhwEkXGvTg
- ✓ Computer Aided Manufacturing
  https://www.youtube.com/watch?v=vvuOSj4SBdk
- ✓ Strength of Materials Laboratory
  https://www.youtube.com/watch?v=IfHJPt4E6OA
- ✓ Manufacturing Technology Laboratory
  https://www.youtube.com/watch?v=4Ky7gPLvU5A
- ✓ Non Traditional Machining Techniques
  https://www.youtube.com/watch?v=QhhQPC1GgH8

Reproducibility and Reusability for further Development:

Name of the Faculty & Courses	Type of Innovation in Teaching & Learning Method	Objective of the Innovation	Significance Results Observed	Template
Dr. S. Ramabalan Industrial Robotics	Learning through Technology (Mind Map Tool)	For better understanding and learning of concepts, new technology provides various tools. Students understands how using digital technology tools could help in boosting task efficiency. By using new tools and technology like hive for extracting important insights from huge data in no time can benefit the user in many ways.	Students got better understanding of concepts and as well as got knowledge of how to use online tools for the subject. It also ensures that students who have missed class either for illness or any other reason stay updated at all times. It eliminates the need for lugging around heavy textbooks and allows students to learn at a time, place and pace that they are comfortable with.	
Dr. S. Krishnamohan Virtual Lab Practices	Learning with Course Certifications (Virtual Lab)	Students follow the course with help of video lectures and are being tested with help of quizzes at the end of all chapters in the course and at the end certificates are earned by them on successfully completing the course	It gives students confidence that they have learned and passed their test. This experience gives exposure to ideas and approaches outside their comfort zone. In addition, they are being able to think outside their experience which is an ingredient of leadership	
Dr. N. Ramanujam Manufacturing Technology	Learning with technology involving creation of YouTube channel	YouTube channels has become one of the teaching tools for teachers all around the world and are adding to their arsenal. The channels make it easier and more convenient for teachers to pass knowledge to	The students were able to attend lecture at any place and at any time. Also, they would explore and learn from more lectures available for all the new technologies and frameworks.	

		students in ways that were never possible in the past. With video lectures it encourages a level of familiarity that helps with building a community and knowledge that is always available and accessible, irrespective of teacher's and student's location.		
Dr. G. Gurumoorthi Refrigeration and Air Conditioning	Leaning through Collaboration	It involves encouraging student collaboration for various projects. We live in a globalized world and collaboration is an essential life skill that is important for all careers and enterprises. Teachers can help foster this skill in the classroom by allowing students to learn, study and work in groups.	Gives students ownership over the learning process ● Increases student motivation to learn ● Allows students to develop useful skills in self- and peer-assessment	
Dr. V. Sivaramakrishnan Design of Machine Elements	Activity based learning	Improve the Methodology to Integrate knowledge and skills	The students were very involved and learned how to develop a Spur gear in CAD Modelling	
Dr. V. Navaneethakrishnan Manufacturing Technology Lab	Student Seminars	In many subjects, students deliver Seminars to the rest of their classmates. This significantly boosts students' confidence and their learning experience.	Bringing out the communication skills of students	

		Idea: To make students develop communication skills and reduce the stage fear in them. **Implementation:** Select topic Each student is assigned a topic; Students are asked to give an explanation on the concept		
Dr. G. Sundaravadivel Heat and Mass Transfer	Learning by Industrial Visit	In order to overcome the gap between the theoretical knowledge and Practical knowledge, this teaching technique is very helpful. Students can understand how to implement their knowledge practically	The students were very involved and learned how the industry works, what practices are followed there and how to prepare for working in industries in the field of Mechanical Engineering.	
Dr. A. Arunkumar, Computer Aided Manufacturing	ICT Support Learning - NPTEL	ICT tools can be used to find, explore, analyze, exchange and present information responsibly and without discrimination. ICT can be employed to give users quick access to ideas and experiences from a wide range of people, communities and cultures. **NPTEL-SWAYAM:** SWAYAM is a programme initiated by Government of India and designed to achieve the three cardinal	Bringing out the expertise in technology with certification, programme skills, confidence of student that they have learned and passed their test. This experience gives exposure to ideas and approaches outside their comfort zone. In addition, they are being able to think outside their experience which is an ingredient of leadership.	

		principles of Education Policy viz., access, equity and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged. Largest online repository in the world of courses in engineering, basic sciences and selected humanities and social sciences subjects. Online facilities are provided to students for enrolling in various NPTEL courses. Faculty encourage the students to take get certified in NPTEL The faculty continuously guide the students and act as a mentor in solving NPTEL assignments. Students follow the course with help of video lectures and are being tested with help of quizzes at the end of all chapters in the course and at the end certificates are earned by them on successfully completing the course.		

ICT Enabled MHRD Supported Virtual Laboratory:

Virtual labs are popularized as a visual education tool that offers diverse analysis of experiments through different components like graphics mediated animations, mathematically modeled simulations, user-interactive emulations, remote-triggered experiments and the use of augmented perception haptic devices. With the advances in ICT-based education, virtual labs have become a novel platform that helps users to engage in their proactive learning process. Our goal is to analyze the effective role of mechanical engineering virtual labs in improving academic performance of students and complementing classroom education. We tested the adaptability, perceived usefulness and ease of use of mechanical engineering virtual labs on different user groups in sciences and engineering. 85% of participants suggested perceived usefulness of mechanical engineering virtual labs helped them to improve their academic performance compared to a traditional classroom scenario. Most users indicated the learning materials provided by virtual lab system were easy to understand, thus suggesting the better adaptability of ICT-enabled techniques amongst different users. This augments the role of virtual labs for remote learners all over the world.

OBJECTIVES:

1. To provide remote-access to simulation-based Labs in various disciplines of Science and Engineering.

2. To enthuse students to conduct experiments by arousing their curiosity. This would help them in learning basic and advanced concepts through remote experimentation.

3. To provide a complete Learning Management System around the Virtual Labs where the students/ teachers can avail the various tools for learning, including additional web-resources, video-lectures, animated demonstrations and self-evaluation.

VALUE Virtual Labs
Virtual Amrita Laboratories Universalizing Education

Ph.+91 (0) 476 2804528, 9446007135
E-mail: virtual_labs@am.amrita.edu
https://vlab.amrita.edu/
https://vlab.co.in

AMRITA VISHWA VIDYAPEETHAM

NME-ICT
MoE
Govt. of India

Nodal Centre Approval Letter

Ref No :AMVLNC24020 Date: 04-01-2024

To
The Principal
E.G.S Pillay Engineering College
Nagapattinam,Tamil Nadu-611002

Dear Sir/Madam,

With reference to the Expression of Interest for a virtual lab nodal centre from **E.G.S Pillay Engineering College**, it gives us immense pleasure to designate your institute as a Nodal Center for Virtual Labs. Dr. S. Krishna Mohan and G. Hari Narayanan has been nominated as the nodal coordinator from your institute. This approval is valid up to one year and is subject to the terms and conditions attached and any subsequent directives as issued by MoE.

We thank you again for your interest in the virtual lab project and appreciate your endeavor in the service of students community. Wishing you all the best!

Sincerely,
Krishna
Prof. Krishnashree Achuthan
Principal Investigator,
Amrita Virtual Labs
Amrita Vishwa Vidyapeetham
Amritapuri- 690 525, India

Amritapuri, Clappana P.O, Kollam, INDIA - 690525. Ph. +91 (0)476 2804528, Mob. 09446007135
E-mail: virtual_labs@am.amrita.edu https://vlab.amrita.edu/

Good lab facilities and updated lab experiments are critical for any engineering college. Paucity of lab facilities often make it difficult to conduct experiments. Also, good teachers are always a scarce resource. The Virtual Labs project addresses this issue of lack of good lab facilities, as well as trained teachers, by providing remote-access to simulation-based Labs in various disciplines of science and engineering. Yet another objective is to arouse the curiosity of the students and permit them to learn at their own pace. This student-centric approach facilitates the absorption of basic and advanced concepts through simulation-based experimentation. Internet-based experimentation further permits use of additional web-resources, video-lectures, animated demonstrations and self-evaluation.

Details of students Completed and Certified by Virtual Labs

AMRITA VISHWA VIDYAPEETHAM

VALUE VIRTUAL LABS broadening perspectives

Virtual Labs — An MHRD Govt of India Initiative

S. No.: VL.2021.487

Certificate of Participation

This is to certify that

KARTHICK J

from **E.G.S. Pillay Engineering College (Autonomous), Nagapattinam**

has participated in the "**Online Course on Virtual Lab**" conducted by **Amrita Vishwa Vidyapeetham** on 19.02.2021.

Krishna

Prof. Krishnashree Achuthan, Ph.D
Principal Investigator
VALUE Virtual labs, Amrita Vishwa Vidyapeetham
Amritapuri, Kerala

AMRITA VISHWA VIDYAPEETHAM

VALUE VIRTUAL LABS broadening perspectives

Virtual Labs — An MHRD Govt of India Initiative

S. No.: VL.2021.503

Certificate of Participation

This is to certify that

NITHISH KUMAR R

from **E.G.S. Pillay Engineering College (Autonomous), Nagapattinam**

has participated in the "**Online Course on Virtual Lab**" conducted by **Amrita Vishwa Vidyapeetham** on 19.02.2021.

Krishna

Prof. Krishnashree Achuthan, Ph.D
Principal Investigator
VALUE Virtual labs, Amrita Vishwa Vidyapeetham
Amritapuri, Kerala

S. No.: VL.2021.501

Certificate of Participation

This is to certify that

NAVEEN.N

from **E.G.S. Pillay Engineering College (Autonomous), Nagapattinam**

has participated in the "**Online Course on Virtual Lab**" conducted by **Amrita Vishwa Vidyapeetham** on 19.02.2021.

Prof. Krishnashree Achuthan, Ph.D
Principal Investigator
VALUE Virtual labs, Amrita Vishwa Vidyapeetham
Amritapuri, Kerala

S. No.: VL.2021.440

Certificate of Participation

This is to certify that

RAJASEKAR U

from **E.G.S. Pillay Engineering College (Autonomous), Nagapattinam**

has participated in the "**Online Course on Virtual Lab**" conducted by **Amrita Vishwa Vidyapeetham** on 19.02.2021.

Prof. Krishnashree Achuthan, Ph.D
Principal Investigator
VALUE Virtual labs, Amrita Vishwa Vidyapeetham
Amritapuri, Kerala

Details of Faculty members completed various certification programs:

No:ATAL/2021/1623596297

ATAL

AMRITA School of Engineering

ALL INDIA COUNCIL FOR TECHNICAL EDUCATION

Nelson Mandela Marg, Vasant Kunj, New Delhi – 110 070

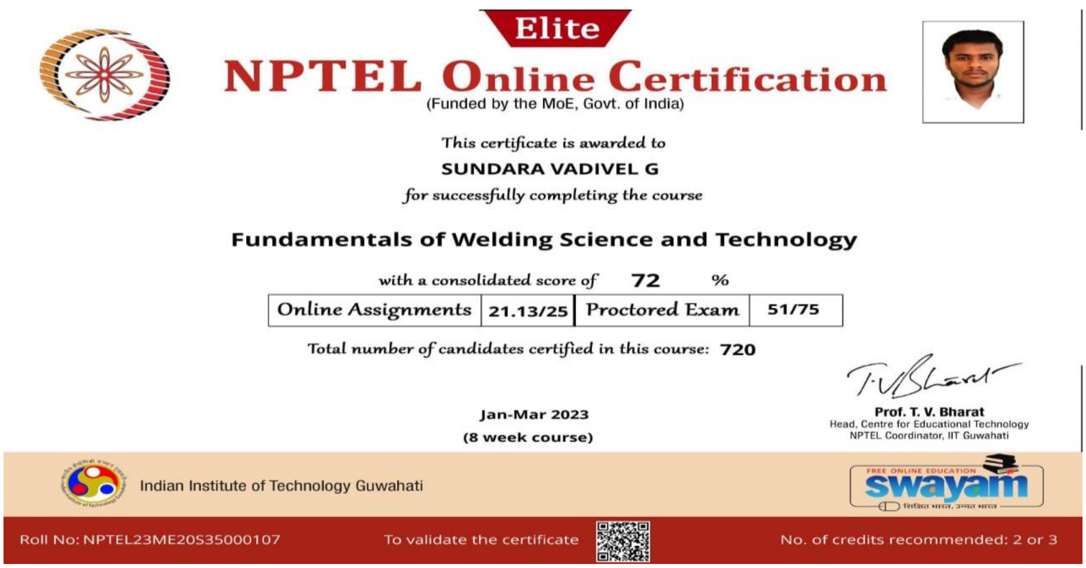
AICTE Training And Learning (ATAL) Academy

Certificate

This is certified that KRISHNA MOHAN, Professor of E.G.S PILLAY ENGINEERING COLLEGES participated & completed successfully AICTE Training And Learning (ATAL) Academy Online Elementary FDP on "Five Days Faculty Development Programme on Green Technology and Sustainability Engineering" from 2021-7-5 to 2021-7-9 at Amrita Vishwa Vidyapeetham.

Adviser-I, ATAL Academy

Coordinator



Elite

NPTEL Online Certification

(Funded by the MoE, Govt. of India)

This certificate is awarded to

SUNDARA VADIVEL G

for successfully completing the course

Fundamentals of Welding Science and Technology

with a consolidated score of 72 %

Online Assignments	21.13/25	Proctored Exam	51/75

Total number of candidates certified in this course: 720

Jan-Mar 2023

(8 week course)

Prof. T. V. Bharat

Head, Centre for Educational Technology

NPTEL Coordinator, IIT Guwahati

Indian Institute of Technology Guwahati

swayam

Roll No: NPTEL23ME20S35000107

To validate the certificate

No. of credits recommended: 2 or 3

NPTEL-AICTE

Faculty Development Programme

(Funded by the MoE, Govt. of India)

This certificate is awarded to

DR V SIVARAMAKRISHNAN

for successfully completing the course

Principles of Metal Forming Technology

with a consolidated score of 60 %

Prof. Andrew Thangaraj

NPTEL Coordinator

IIT Madras

(Jul-Sep 2023)

Roll No: NPTEL23ME125S35470101

Duration of NPTEL course : 8 Weeks

The candidate has studied the above course through MOOCs mode, has submitted online assignments and passed proctored exams.

This certificate is therefore acceptable for promotions under CAS as per AICTE notifications dated 24th July 2018, similar to other refresher / orientation courses.

F.No. AICTE / RIFD / FDP through MOOCs / 2017-18

Quiz & True or False:

E.G.S. PILLAY ENGINEERING COLLEGE
(AUTONOMOUS)
Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai
Accredited by NAAC with 'A' Grade | An ISO 9001 : 2008 Certified Institution
NAGAPATTINAM – 611002 TAMIL NADU INDIA
Ph : 04365-251112 / 251114 | E-mail:enquires@egspec.org | Website : www.egspec.org

DEPARTMENT OF MECHANICAL ENGINEERING

1702ME703 – COMPUTER AIDED MANUFACTURING

QUIZ & True (or) False

Marks: 10

Reg. No: ______________ **Name:** ________________________ **Date:** ____________

1. In AM process, orientation size and location of the manufacturing components are adjusted by **CO5**

   (A) Manually

   (B) Software

   (C) Machine itself

   (D) Process itself

2. The complex cores in pump manufacturing industries are preferred AM technique. State True or False. **CO5**

   (A) True

   (B) False

3. Assertion (A): In AM process, software is available to directly link the design to an AM machine. **CO5**

   Reason (R): Skilled machine operator is not required in the AM process.

   A) Both A and R are true and R is the correct explanation of A.

   (B) Both A and R are true but R is not the correct explanation of A.

   (C) A is true but R is false.

   (D) A is false but R is true.

   (E) Both A and R are false.

4. Some of the steel hubs in aerospace applications are produced in rapid prototyping technique without any phase change. State True or False **CO5**

   (A) True

   (B) False

5. In die manufacturing process, select the suitable reasons while the AM technique is preferred **CO5**

   1. Increase of the possible design iterations
   2. Reduction in prototyping times
   3. Suitable for simple models only
   4. Very less tooling cost
   5. Reduction in prototyping costs

   (A) 1, 2, 3 & 5

   (B) 3, 4 & 5

   (C) 1, 2 & 5

   (D) 2, 3 & 4

6. The Stereo-Lithography Apparatus(SLA) works based on _____________ **CO5**

(A) Photo polymerization

(B) Solidification cooling

(C) Laser driven sintering

(D) Binder droplets

7. For producing the maximum part size in epoxy material, the preferred method is **CO5**

(A) Three dimensional printing

(B) Wide area thermal inkjet

(C) Stereo lithography

(D) Laminated object manufacturing

8. In SLA the laser light source used to cure the surface of the component. State True or False **CO5**

(A) True

(B) False

9. Triangulation is not one of the process chain of SLA process. State True or False **CO5**

(A) True

(B) False

10. Assertion (A): The SLA process required post curing step. **CO5**

Reason (R): Laser is not of high enough power to complete.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

(E) Both A and R are false.

<u>Role Play</u> **<u>Group Task</u>**

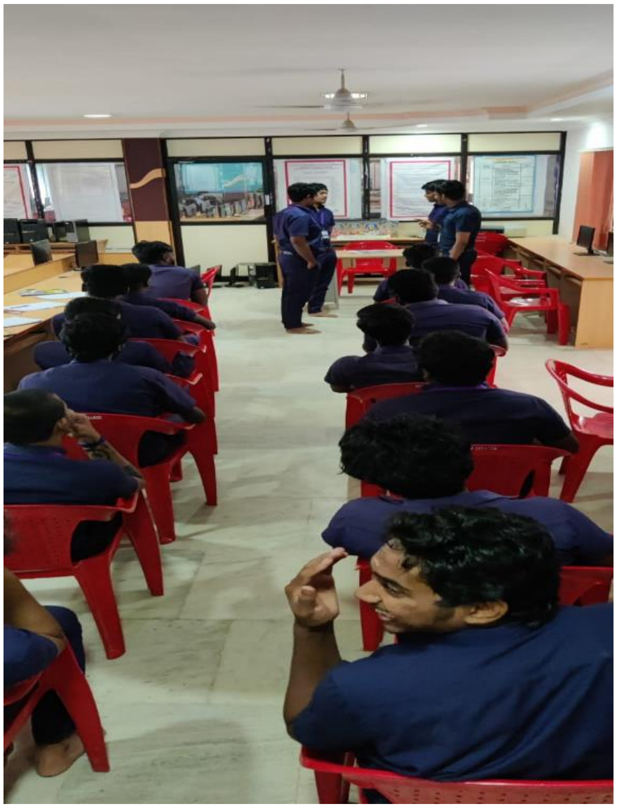


Fig. 5.5: Snapshot of Role Play

Fig. 5.6: Snapshot of Group Task

<u>Presentation Skills and Videos</u>

Fig. 5.7: Snapshot of Presentation Skills

E.G.S. PILLAY ENGINEERING COLLEGE, NAGAPATTINAM.

Department of Mechanical Engineering

Academic Year 2023 – 2024 (Even Semester)

Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

1. **(a) Course Outcomes (COs):**

After successful completion of the course, students will be able to

	Competency	Cognitive level
CO1	Explain the basics of robots.	Understand
CO2	Make use of end effectors and actuators of robots.	Apply
CO3	Experiment with sensors and machine vision system of robots.	Apply
CO4	Prepare kinematics and programming of robots.	Apply
CO5	Describe safety aspects and implementation of robot project, and applications of robots in industries and other fields.	Understand

(b). Program Outcomes (PO)

After successful completion of the programme, Graduates will be able to

PO1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

(c). Program Specific Outcomes (PSO)

After successful completion of the programme, Graduates will be able to

PSO1: Design, develop, test and maintain advanced thermal engineering systems for industrial and other applications.

PSO2: Apply the concepts of modern manufacturing and industrial engineering techniques in industries.

PSO3: Modeling, design and analysis of mechanical components using Computer Aided Design and Analysis software tools.

V. COs Vs POs/PSOs Matrix

Comp.	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P1O**	**PO11**	**PO12**	**PSO 1**	PSO 2	PSO 3
CO1	M	L	-	-	-	M	-	S	-	-	-	L	-	M	-
CO2	S	M	L	S	-	S	-	-	S	-	S	L	-	S	-
CO3	S	M	L	S	-	S	-	-	S	-	S	L	-	S	-
CO4	S	M	L	S	M	S	-	-	S	-	S	L	-	S	-
CO5	M	L	-	-	-	M	-	S	-	-	-	L	-	M	-

Support provided by COs to POs/PSOs: L = lightly(1); M = Moderately (2); S = Substanially (3)

Explanations:

CO1: Explain the basics of robots.

This CO contributes to

-(moderately) (PO1): Apply the robotics fundamentals to solve complex industrial and societial problems,

-(lightly) (PO2): Analyze the usage of robotics fundamentals to solve complex industrial and societial problems,

-(moderately) (PO6): Use the robots to find solutions to societal and health related issues,

-(substantially) (PO8): Adhere to ethical codes of robotics,

-(moderately) (PO11): Able to use robotics fundamentals for doing robot fabrication and material handling systems fabrication projects and

-(lightly) (PO12): Induce the learner to know more about the advances in robotics and robot's applications by life-long learning.

Also, this CO contributes to (moderately) (PSO2): Apply the concepts of robotics fundamentals in automation, modern manufacturing and industrial engineering.

CO2: Make use of end effectors and actuators of robots.

This CO contributes to

-(substantially) (PO1): Use the end effectors and actuators of robots to solve complex industrial and societal problems,

-(moderately) (PO2): Analyze the usage of end effectors and actuators of robots in complex industrial and societal problems,

-(lightly) (PO3): Design and development of robots using end effectors and actuators,

-(substantially) (PO4): Examining and evaluating how the end effectors and actuators are applied to find valid solutions

-(substantially) (PO6): Use the end effectors and actuators of robots to find solutions to societal and health related issues,

-(substantially) (PO9): Function effectively as the individual and as a team member in robot fabrication project using sensors and machine vision system,

-(substantially) (PO11): able to use of end effectors and actuators for doing robot fabrication and material handling systems fabrication projects and

-(lightly) (PO12): Induce the learner to know more about the advancement in robot end effectors and actuators by life-long learning.

Also, this CO contributes to (substantially) (PSO2): Apply the concepts of robot end effectors and actuators in automation, modern manufacturing and industrial engineering.

CO3: Experiment with sensors and machine vision system of robots.
This CO contributes to
-(substantially) (PO1): Use the sensors and machine vision system of robots to solve complex industrial and societal problems,
-(moderately) (PO2): Analyze the usage of sensors and machine vision system of robots in complex industrial and societal problems,
-(lightly) (PO3): Design and development of robots using sensors and machine vision system,
-(substantially) (PO4): Examining and evaluating how the sensors and machine vision system of robots are applied to find valid solutions
-(substantially) (PO6): Use of sensors and machine vision system of robots to find solutions to societial and health related issues,
-(substantially) (PO9): Function effectively as the individual and as a team member in robot fabrication project using sensors and machine vision system,
-(substantially) (PO11): able to use of sensors and machine vision system of robots for doing robot fabrication and material handling systems fabrication projects and
-(lightly) (PO12): Induce the learner to know more about the advancement in sensors and machine vision system of robots by life-long learning.
Also, this CO contributes to (substantially) (PSO2): Apply the concepts of sensors and machine vision system of robots in automation, modern manufacturing and industrial engineering.

CO4: Prepare kinematics and programming of robots.
This CO contributes to
-(substantially) (PO1): Use the robots' kinematics and programming to solve complex industrial and societal problems,
-(moderately) (PO2): Analyze the robots' kinematics and programming in complex industrial and societial problems,
-(lightly) (PO3): Design and development of robots using the robots' kinematics and programming,
-(substantially) (PO4): Examining and evaluating how the robots' kinematics and programming are applied to find valid solutions
-(moderately) (PO5): how the robots' kinematics and programming are prepared using advanced computer languages and software packages like Workspace, RobotAnalyzer, RoKiSim,etc,
-(substantially) (PO6): Use the robots' kinematics and programming to find solutions to societial and health related issues,
-(substantially) (PO9): Function effectively as the individual and as a team member in robot fabrication project using the robots' kinematics and programming,
-(substantially) (PO11): able to use the robots' kinematics and programming for doing robot fabrication and material handling systems fabrication projects and
-(lightly) (PO12): Induce the learner to know more about the advancement in the robots' kinematics and programming by life-long learning.
Also, this CO contributes to (substantially) (PSO2): Apply the concepts of the robots' kinematics and programming in automation, modern manufacturing and industrial engineering.

CO5: Describe safety aspects and implementation of robot project and applications of robots in industries and other fields.
This CO contributes to
-(moderately) (PO1): Apply the safety aspects and implementation of robot project to solve complex industrial and societal problems,
-(lightly) (PO2): Analyze the safety aspects and implementation of robot project to solve complex industrial and societal problems,
-(moderately) (PO6): Use the robots to find solutions to societal and health related issues,
-(substantially) (PO8): Adhere to ethical codes of robotics,
-(lightly) (PO12): Induce the learner to know more about the safety aspects and implementation of robot project by life-long learning.
Also, this CO contributes to (moderately) (PSO2): Apply the concepts of safety aspects and

implementation of robot project in automation, modern manufacturing and industrial engineering.

E.G.S. PILLAY ENGINEERING COLLEGE, NAGAPATTINAM.

Department of Mechanical Engineering

Academic Year 2021 – 2022 (Even Semester)

Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

Innovative Practice No: 1 Description

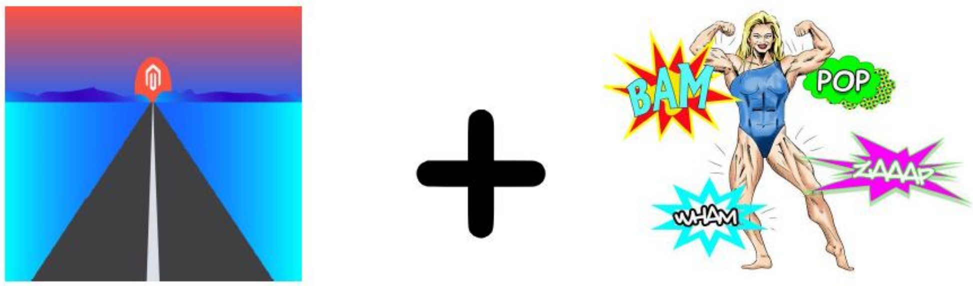
- **Module / Topic: Module 1 /** Robot Parts
- **Course Outcome:** CO 1
- **Activity Chosen: Quiz**
- **Justification:**

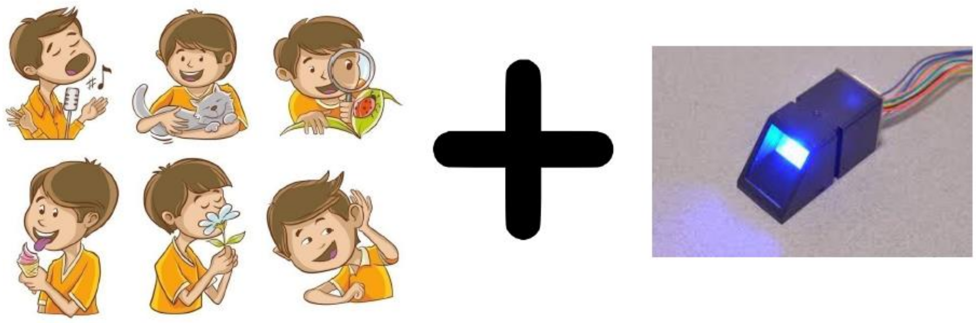
  Not only are quizzes fun for students, they are also a sneaky form of learning as they don't feel like a traditional activity. Quizzes can help our students practice existing knowledge while stimulating interest in learning about new subject matter. Quizzes are fun, raise confidence, students can aid planning and identify progress, support individualized learning, great for plenary, great for end of topic assessments, good for revision, help tracking, encourage students' self awareness of progress and self assessment, and help teachers have rich feedback dialogue with pupils.

- **Time Allotted for the Activity:** 30 Minutes
- **Details of the Implementation:**

  Students were shown the following pictures and asked them to identify the name of the robot parts by connecting the pictures.

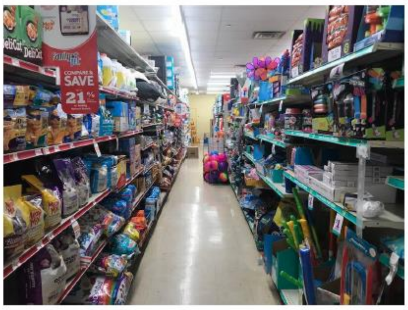
Quiz questions:
Identify the name of the robot parts by referring the following pictures:






motorola
moto g


Welcome to Tor Browser
You are now free to browse the internet anonymously
Test Tor Network Settings


SAVE
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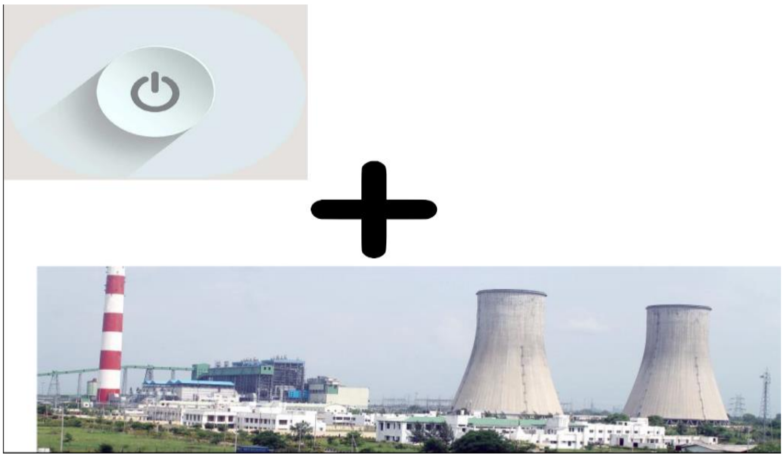


- **Reflective Critique:**
  - ***Feedback of practice from students and other stakeholders:***

    The practice was well-received by students, who said it helped them remember subjects and substance while writing exams. They also noted that they enjoyed very much fun; they used their creative thinking ability. Also this activity boosts their confidence.

  - ***Benefit of the practice:*** (E.g.: Outcome attainment would have increased due to innovative practice over conventional practice)

The Students eagerly participated in that activity and then they acquired theknowledge of robot pars. Due to this activity, the students were able to recall the topic and remember the important terms easily.

❖ ***Challenges faced in implementation:***

I have planned this activity for 30 minutes. Students take some time to answer all the questions. Some time is spent for appreciating students by giving prizes. So, it takes another 10 minutes for completing the activity.

- **Images / Screenshot of the practice:**

References:

- Groover, M.P. Industrial Robotics – Technology, Programming and Applications, McGraw- Hill, 2001.

- Klafter R.D., Chmielewski T.A and Negin M., Robotic Engineering - An Integrated Approach, Prentice Hall, 2003.

E.G.S. PILLAY ENGINEERING COLLEGE, NAGAPATTINAM.

Department of Mechanical Engineering

Academic Year 2023 – 2024 (Even Semester)

Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

Innovative Practice No: 2 Description

- **Module / Topic: Module 1 /** Robot Parts
- **Course Outcome:** CO 1
- **Activity Chosen: Sketch Notes**
- **Justification:**
  Sketchnoting uses both elements to create something new and powerful! Information and Illustrations work in tandem to create understanding and clarity. The illustrations are there to help the student to understand the text, and the text is there to help him or her to understand the images.

- **Time Allotted for the Activity:** 30 Minutes
- **Details of the Implementation:**

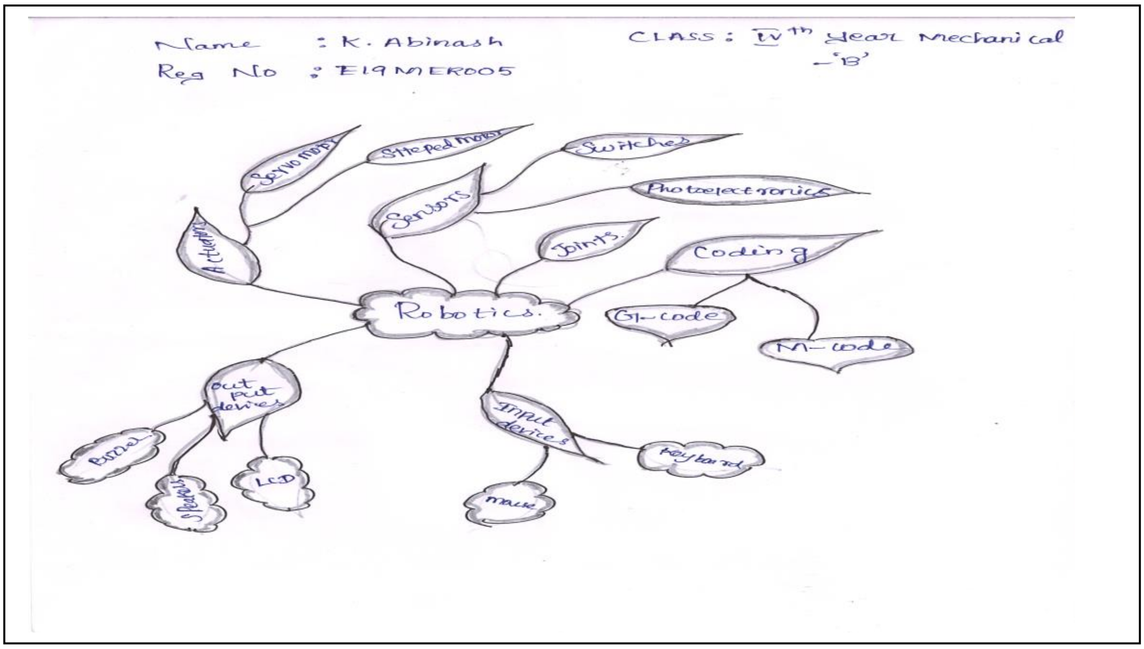
  Students were asked to prepare a sketch note about "Robot parts". They Students were divided into groups and each group has 2 members. They discussed and prepared the mind map about robot parts.

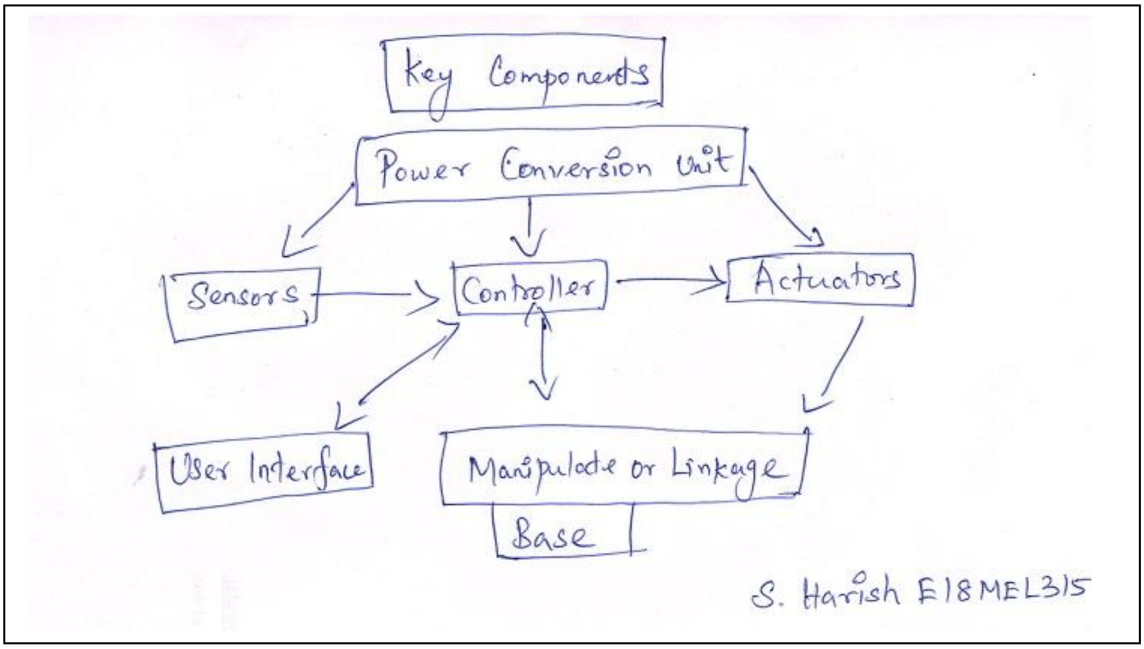
- **Reflective Critique:**
  - ***Feedback of practice from students and other stakeholders:***
    The practice was well-received by students, who said it helped them remember the important topics of robot parts. This will help them while writing exams. They also noted that this activity boosts their confidence.

  - ***Benefit of the practice:*** (E.g.: Outcome attainment would have increased due to innovative practice over conventional practice)
    The Students eagerly participated in that activity and then they acquired the knowledge of robot parts Due to this activity, the students were able to recall the topic and remember the important terms related to robot parts easily. This activity helped the staff to get an immediate feedback about understanding of the students.

  - ***Challenges faced in implementation:***
    I have planned this activity for 30 minutes. Students take some time to prepare a sketch note. After formed the group, they started to prepare their sketch note. Studentsasked doubts regarding the sketch note preparation. I've given a brief overview about preparing sketch notes and encouraged the students to prepare which it takes another 5 minutes for completing the activity.

- **Images / Screenshot of the practice:**





References:

❖ Groover, M.P. Industrial Robotics – Technology, Programming and Applications, McGraw- Hill, 2001.

❖ Klafter R.D., Chmielewski T.A and Negin M., Robotic Engineering - An Integrated Approach, Prentice Hall, 2003.

E.G.S. PILLAY ENGINEERING COLLEGE, NAGAPATTINAM.

Department of Mechanical Engineering

Academic Year 2023 – 2024 (Even Semester)

Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

Innovative Practice No: 3 Description

- **Module / Topic: Module 1 /** Robot Parts
- **Course Outcome:** CO 1
- **Activity Chosen: One minute paper**
- **Introduction:**

  The one-minute paper is an instructional strategy that uses a short writing task to assess learner understanding of course material. It is usually assigned with an open-ended question(s) in the last 5 – 10 minutes of class. Because it is intended as a formative strategy, this technique can serve as a quick way for an instructor to gage class comprehension as well as provide learners with the means to self-assess their own understanding. The one-minute paper allows students to introspectively reflect on their development. It can provide a platform for students to make anonymous comments and give a teacher a jumping off point on the learning material and the competency development. If structured accordingly, the one-minute paper allows students to learn from each other best practices.
- **Time Allotted for the Activity:** 1 Minute
- **Details of the Implementation:**

  Students are asked to write a brief reflection reflecting their understanding of a lesson taught about robot end effectors. Time limit is provided (e.g., 1 min). Individually, students provide a written response(s)/reflection(s). Reflection(s) can address issues such as:
  - What is the most important thing you have learned during this class?
  - What important question(s) still remains unanswered?

    Staff collects written reflections (immediately or after class) and uses them to determine the lesson plan in regards to, for example:
  - What concepts or topics need further review or explanation;
  - What activities or materials can be used next.
- **Reflective Critique:**
  - ❖ ***Feedback of practice from students and other stakeholders:***

    The practice was well-received by students, who said it helped them to express their understanding of the subject. In next class, they receive more details about the vague topics. Also, this activity boosts their confidence.

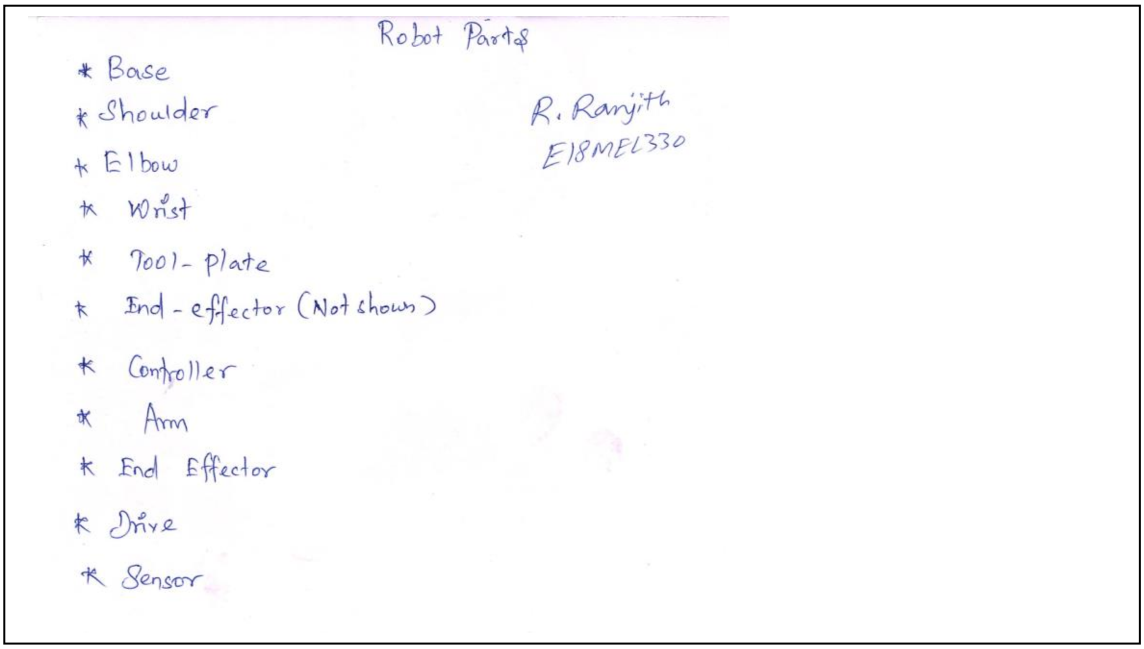
  - ❖ ***Benefit of the practice:*** (E.g.: Outcome attainment would have increased due to innovative practice over conventional practice)

    The students eagerly participated in that activity and then they acquired the knowledge of robot end effectors. Due to this activity, the students were able to recall the topic and remember the important terms easily. This activity helped the staff to get immediate feedback about understanding of the students.

❖ ***Challenges faced in implementation:***

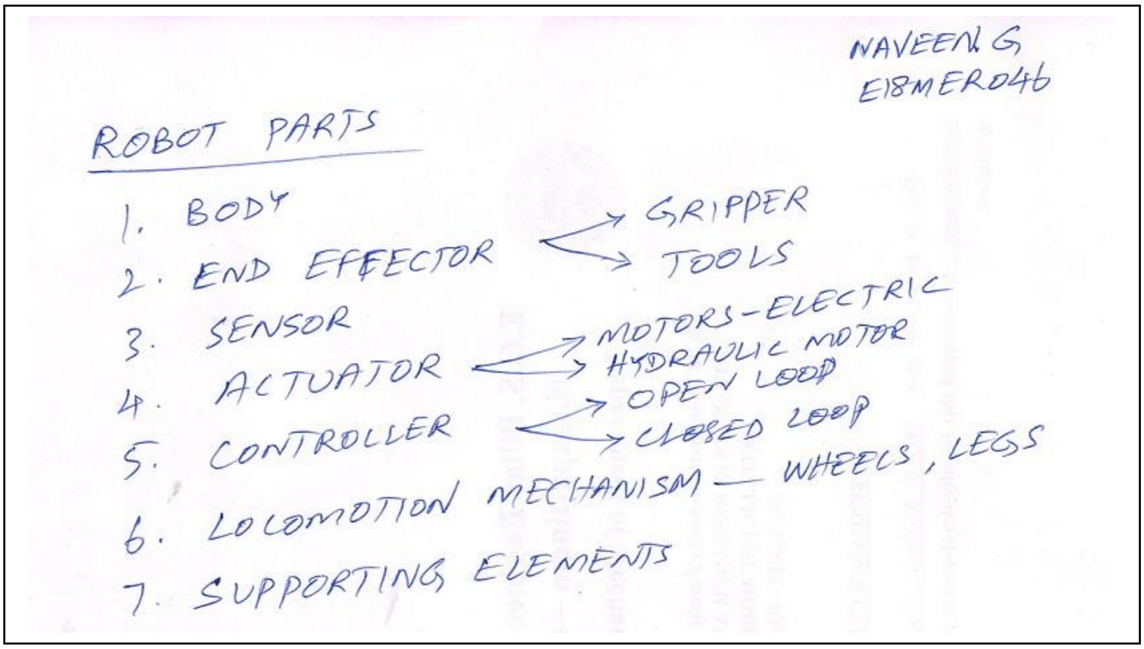
I have planned this activity for last 2 minutes. Students take some time to write and hand over their written material. So, it takes another 5 minutes for completing the activity.

- **Images / Screenshot of the practice:**


Robot Parts

R. Ranjith
E18MEL330

* Base
* Shoulder
* Elbow
* Wrist
* Tool- plate
* End - effector (Not shown)
* Controller
* Arm
* End Effector
* Drive
* Sensor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ROBOT PARTS

1. BODY
2. END EFFECTOR → GRIPPER, TOOLS
3. SENSOR
4. ACTUATOR → MOTORS - ELECTRIC, HYDRAULIC MOTOR
5. CONTROLLER → OPEN LOOP, CLOSED LOOP
6. LOCOMOTION MECHANISM — WHEELS, LEGS
7. SUPPORTING ELEMENTS

References:

❖ Groover, M.P. Industrial Robotics – Technology, Programming and Applications, McGraw- Hill, 2001.

❖ Klafter R.D., Chmielewski T.A and Negin M., Robotic Engineering - An Integrated Approach, Prentice Hall, 2003.

E.G.S. PILLAY ENGINEERING COLLEGE, NAGAPATTINAM.

Department of Mechanical Engineering

Academic Year 2023 – 2024 (Even Semester)

Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

Innovative Practice No: 4 Description

- **Module / Topic: Module 2 /** Robot Actuators
- **Course Outcome:** CO 2
- **Activity Chosen: Brain Storming**
- **Justification:**

  Brain storming session is for clearing doubts of the students. Its main purpose is to solve a problem creatively or innovatively. Brainstorming also emphasizes on improving our ideation process and elevates the creative thinking of individuals. One of the major objectives of brainstorming is to withhold criticism and welcome all sorts of ideas to the table.

- **Time Allotted for the Activity:** 20 Minutes
- **Details of the Implementation:**

  Students were taught about robot actuators, types, construction, working principle, applications, advantages and disadvantages. Students asked to give answer for the questions raised by the staff and classmates. Students are appreciated for their correct answer. Also they understood the subject.

- **Reflective Critique:**
  - ***Feedback of practice from students and other stakeholders:***
    The practice was well-received by students, who said it helped them to clear their related to the subjects. It will help them in remembering of the concepts and for writing exams. They also noted that their level of understanding of the subject.
  - ***Benefit of the practice:*** (E.g.: Outcome attainment would have increased due to innovative practice over conventional practice)
    The Students eagerly participated in that activity and then they acquired the knowledge of robot actuators. Due to this activity, the students were able to recall the topic and remember the important concepts easily.
  - ***Challenges faced in implementation:***
    I have planned this activity for 20 minutes. Students actively participated. They raised many questions. They interacted well with their classmates. So it takes another 10 minutes for completing the activity.

- **Images / Screenshot of the practice:**

References:

- Groover, M.P. Industrial Robotics – Technology, Programming and Applications, McGraw- Hill, 2001.
- Klafter R.D., Chmielewski T.A and Negin M., Robotic Engineering - An Integrated Approach, Prentice Hall, 2003.

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Department of Mechanical Engineering

Academic Year 2023 – 2024 (Even Semester)

Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

Innovative Practice No: 5 Description

- **Module / Topic: Module 2 /** Robot End-effectors
- **Course Outcome:** CO 2
- **Activity Chosen: Class poll**
- **Justification:**

Polls are quick and easy tools for tracking student attendance in both medium-and large-sized classes. To track attendance, instructors must have a way to sync the responses from a poll to student identity. Most high-tech polling systems have a built-in attendance system that tracks student participation throughout the questions asked during a class period and calculates a participation (or attendance) score.

- **Time Allotted for the Activity:** 30 Minutes
- **Details of the Implementation:**

Students were asked 15 yes or no type questions related to "Robot end-effectors". They raised their hand. Their response for correct answer of a question was noted. They were encouraged for giving correct answers.

- **Reflective Critique:**
  - ***Feedback of practice from students and other stakeholders:***

    The practice was well-received by students, who said it helped them remember subjects and substance while writing exams. They also noted that this activity boosts their confidence.

  - ***Benefit of the practice:*** (E.g.: Outcome attainment would have increased due to innovative practice over conventional practice)

    The Students eagerly participated in that activity and then they acquired the knowledge of robot end-effectors. Due to this activity, the students were able to recall the topic and remember the important terms easily.

  - ***Challenges faced in implementation:***

    I have planned this activity for 30 minutes. Students take some time to answer all the questions. So it takes another 10 minutes for completing the activity.

- **Images / Screenshot of the practice:**

References:

- Groover, M.P. Industrial Robotics – Technology, Programming and Applications, McGraw- Hill, 2001.
- Klafter R.D., Chmielewski T.A and Negin M., Robotic Engineering - An Integrated Approach, Prentice Hall, 2003.

E.G.S. PILLAY ENGINEERING COLLEGE, NAGAPATTINAM.

Department of Mechanical Engineering

Academic Year 2023 – 2024 (Even Semester)

Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

Innovative Practice No: 6 Description

- **Module / Topic: Module 3 /** Robot sensors
- **Course Outcome:** CO 3
- **Activity Chosen: Finger signal**
- **Justification:**
  Students are using their fingers to give signal for conveying information about an object. Without speaking or making sound, student tries to convey the information. So the observer is able to think about the signals and easily identify the name of the objects.
- **Time Allotted for the Activity:** 30 Minutes
- **Details of the Implementation:**
  10 willingness students were called for the stage. A sensor name wrote on a piece of paper. 10 papers were prepared. Each student picked a sheet from them. He read the name of the sensor wrote on the paper. He tried to convey the name of the sensor by only using his fingers. Observers watched his finger signals, tried to say the name of the sensor. The students were appreciated by giving a prize for their correct answer.

- **Reflective Critique:**
  - ***Feedback of practice from students and other stakeholders:***
    The practice was well-received by students, who said it helped them remember subjects and substance while writing exams. They enjoyed a great fun. They were happy. They also noted this activity boosts their confidence.

  - ***Benefit of the practice:*** (E.g.: Outcome attainment would have increased due to innovative practice over conventional practice)
    The Students eagerly participated in that activity and then they acquired the knowledge of robot end-effectors. Due to this activity, the students were able to recall the topic and remember the important terms easily.

  - ***Challenges faced in implementation:***
    I have planned this activity for 30 minutes. Students took more time to answer for all questions. So it takes another 10 minutes for completing the activity.

- **Images / Screenshot of the practice:**

References:

- Groover, M.P. Industrial Robotics – Technology, Programming and Applications, McGraw- Hill, 2001.
- Klafter R.D., Chmielewski T.A and Negin M., Robotic Engineering - An Integrated Approach, Prentice Hall, 2003.

E.G.S. PILLAY ENGINEERING COLLEGE, NAGAPATTINAM.

Department of Mechanical Engineering

Academic Year 2023 – 2024 (Even Semester)

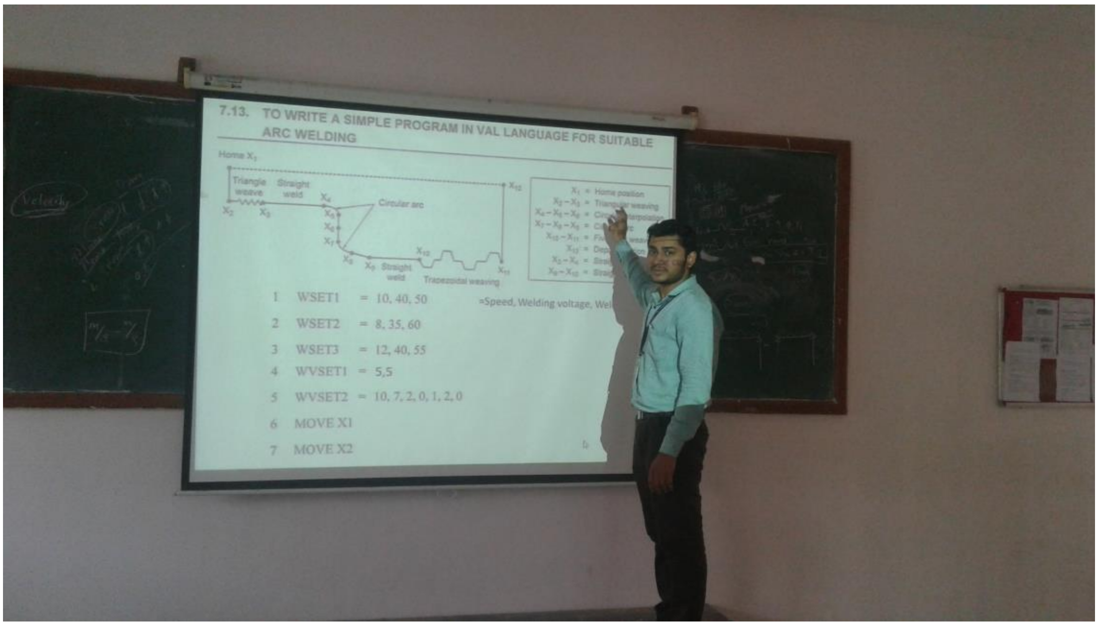
Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

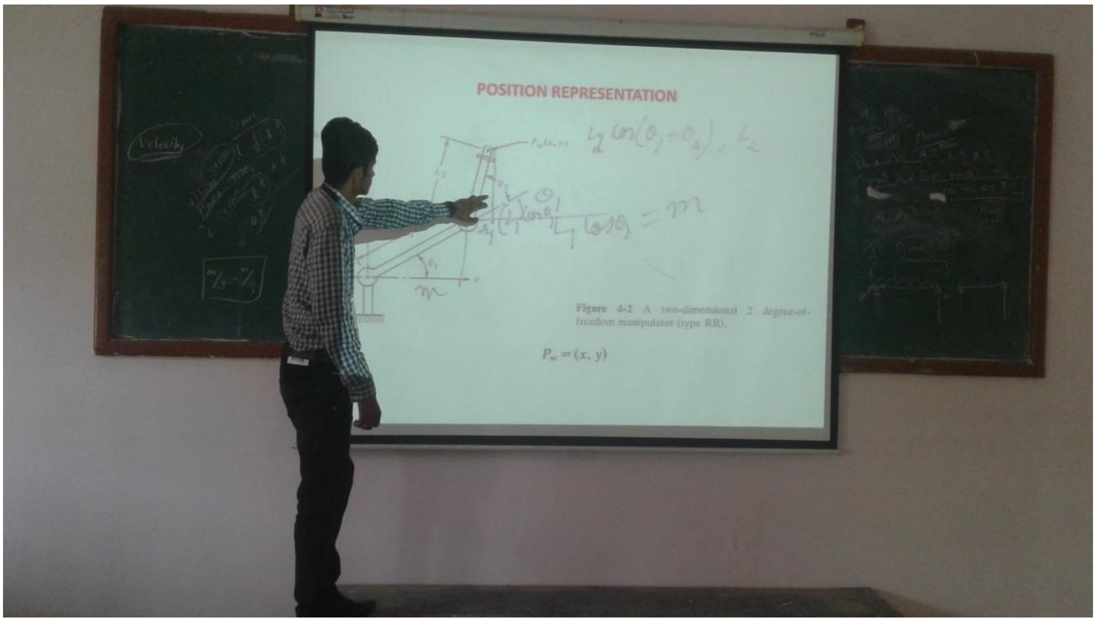
<u>Innovative Practice No: 7 Description</u>

- **Module / Topic: Module 4 /** Robot Kinematics and robot programming
- **Course Outcome:** CO 4
- **Activity Chosen: Flipped classroom**
- **Justification:**
  The flipped classroom model is based on the idea that traditional teaching is invertedin the sense that what is normally done in class is flipped or switched with that which is normally done by the students out of class. This Activity gives the clear understanding of the particular topics – Robot Kinematics and robot programming.
- **Time Allotted for the Activity:** 30 Minutes
- **Details of the Implementation:**
  Students were given the task of preparing a presentation on the topic of "Robot Kinematics and robot programming ". They described derivation of kinematic equations for a robot and Arc welding programme for a robot. Students were divided into groups and each group will prepared the detailed presentation of "Robot Kinematics and robot programming" and deliver their presentation among all the students.
- **Reflective Critique:**
  - ***Feedback of practice from students and other stakeholders:***
    The practice was well-received by students, who said it helped them remember subjects and substance while writing exams. They also noted that because they are presenting in front of all of the students, this activity boosts their confidence.
  - ***Benefit of the practice:*** (E.g.: Outcome attainment would have increased due to innovative practice over conventional practice)
    The Students eagerly participated in that activity and then they acquired the knowledge of "Robot Kinematics and robot programming". Due to this activity, the students were able to recall the topic and remember the important terms easily.
  - ***Challenges faced in implementation:***

I have planned this activity for 30 minutes. Students take some time to present the topic. After formed the group, they present the topic with presentation. Students asked doubts regarding the topic before presentation. I've given a brief overview of the topics and encouraged the students to present which it takes another 5 minutes for completing the activity.

- **Images / Screenshot of the practice:**





References:

- ❖ Groover, M.P. Industrial Robotics – Technology, Programming and Applications, McGraw- Hill, 2001.
- ❖ Klafter R.D., Chmielewski T.A and Negin M., Robotic Engineering - An Integrated Approach, Prentice Hall, 2003.

E.G.S. PILLAY ENGINEERING COLLEGE, NAGAPATTINAM.

Department of Mechanical Engineering

Academic Year 2023 – 2024 (Even Semester)

Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

Innovative Practice No: 8 Description

- **Module / Topic: Module 4 /** Robot forward and inverse Kinematics
- **Course Outcome:** CO 4
- **Activity Chosen: Collaborative Learning**
- **Justification:**

  Collaborative learning is an educational approach for teaching and learning that involves groups of students working together to solve a problem, complete a task. Here this method is used to know how to solve problems related to robot kinematics. Students must understand the concept of robot kinematics and formulae derivation for forward and inverse Kinematics.
- **Time Allotted for the Activity:** 40 Minutes
- **Details of the Implementation:**

First split the students into groups and ask them to sit as a group. The topic is divided into sub topics and each group of students allotted for sub topics. Students were asked to prepare the topic prior. They discussed within their group about the topic and present about the robot kinematics for three robot configurations.

- **Reflective Critique:**
  - ❖ ***Feedback of practice from students and other stakeholders:***

    Students stated that they appreciated the activity and that it helped them remember topics and content when writing assessments.
  - ❖ ***Benefit of the practice:*** (E.g.: Outcome attainment would have increased due to innovative practice over conventional practice)

    The Students eagerly participated in that activity and then they acquired the concept of Forward and Inverse robot kinematics. Due to this activity, the students were able to recall the topic and remember the important terms easily.
  - ❖ ***Challenges faced in implementation:***

    I have planned this activity for 40 minutes. Students take some time to forming the group. After formed the group, they discussed the topic. Students asked doubts regarding the topic before presentation. I've given a brief overview of the robot kinematics. I encouraged the students which it takes another 5 minutes for completing the activity.

- **Images / Screenshot of the practice:**

References:

- Groover, M.P. Industrial Robotics – Technology, Programming and Applications, McGraw- Hill, 2001.
- Klafter R.D., Chmielewski T.A and Negin M., Robotic Engineering - An Integrated Approach, Prentice Hall, 2003.

E.G.S. PILLAY ENGINEERING COLLEGE, NAGAPATTINAM.

Department of Mechanical Engineering

Academic Year 2023 – 2024 (Even Semester)

Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

Innovative Practice No: 9 Description

- **Module / Topic: Module 4 /** Robot Programming
- **Course Outcome:** CO 4
- **Activity Chosen: Mind Map**
- **Justification:**

  A mind map involves writing down a central theme and thinking of new and related ideas which radiate out from the centre. By focusing on key ideas written down in your own words and looking for connections between them, you can map knowledge in a way that will help you to better understand and retain information. It helps you remember and recall information.

  - It helps you learn new concepts.
  - It's a fun way of learning.
  - It makes complex ideas easier to understand.
  - It improves your presenting.
  - It boosts your creativity.
  - It improves productivity.
  - It's flexible.

- **Time Allotted for the Activity:** 30 Minutes
- **Details of the Implementation:**

  Students were asked to prepare a mind map about "Robot programming". They Students were divided into groups and each group has 2 members. They discussed and prepared the mind map about robot programming.

- **Reflective Critique:**
  - ❖ ***Feedback of practice from students and other stakeholders:***

    The practice was well-received by students, who said it helped them remember the important topics of robot programming. This will help them while writing exams. They also noted that this activity boosts their confidence.

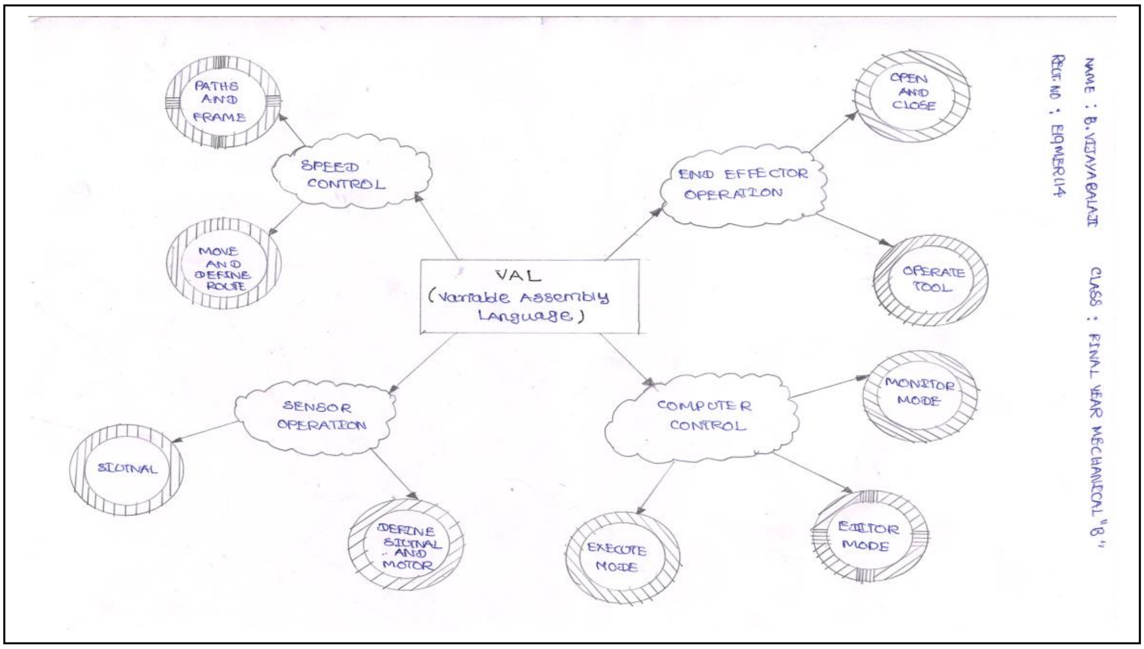
  - ❖ ***Benefit of the practice:*** (E.g.: Outcome attainment would have increased due to innovative practice over conventional practice)

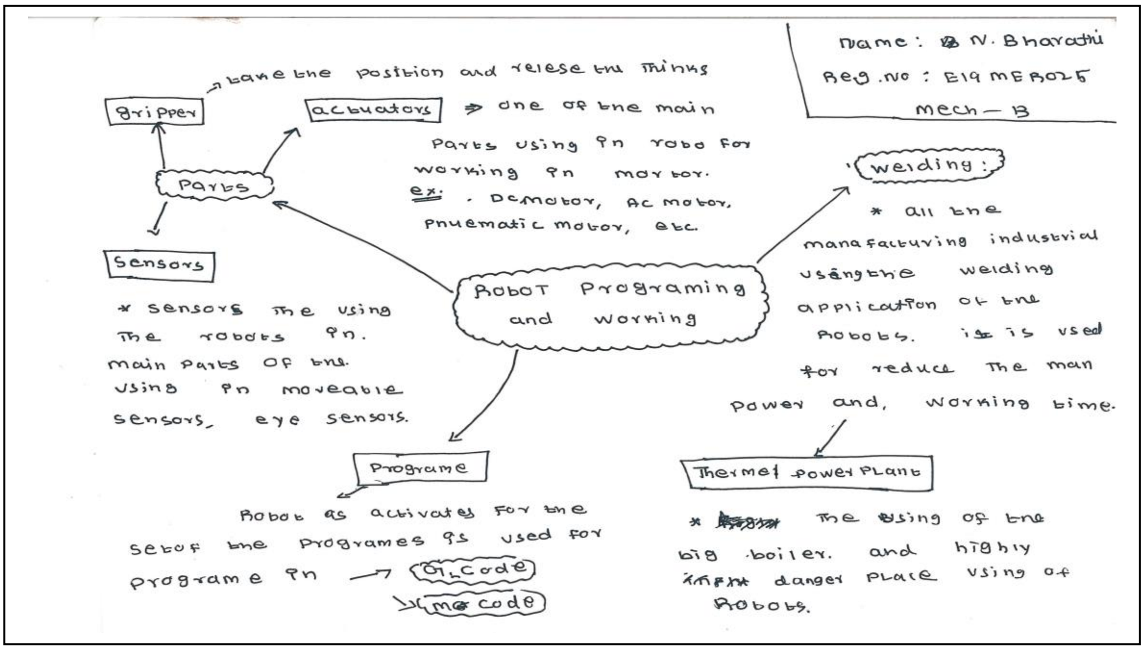
    The Students eagerly participated in that activity and then they acquired the knowledge of robot programming. Due to this activity, the students were able to recall the topic and remember the important terms related to robot programming easily. This activity helped the staff to get an immediate feedback about understanding of the students.

❖ ***Challenges faced in implementation:***

I have planned this activity for 30 minutes. Students take some time to prepare mind map. After formed the group, they started to prepare their mind map. Students asked doubts regarding the mind map preparation. I've given a brief overview about preparing mind map and encouraged the students to prepare which it takes another 5 minutes for completing the activity.

- **Images / Screenshot of the practice:**





References:

❖ Groover, M.P. Industrial Robotics – Technology, Programming and Applications, McGraw- Hill, 2001.

❖ Klafter R.D., Chmielewski T.A and Negin M., Robotic Engineering - An Integrated Approach, Prentice Hall, 2003.

E.G.S. PILLAY ENGINEERING COLLEGE, NAGAPATTINAM.

Department of Mechanical Engineering

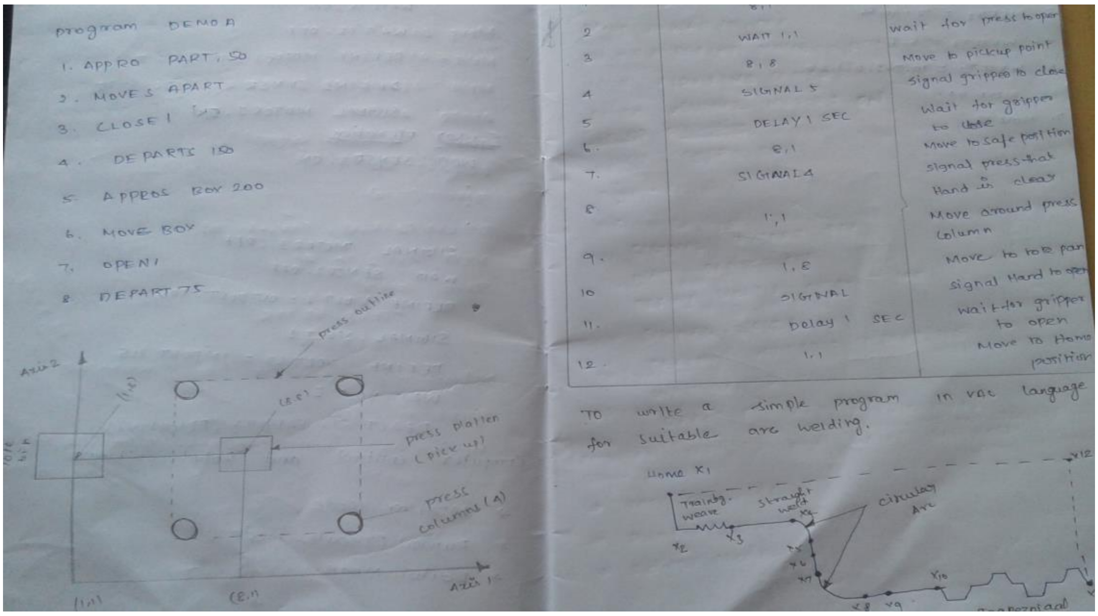
Academic Year 2023 – 2024 (Even Semester)

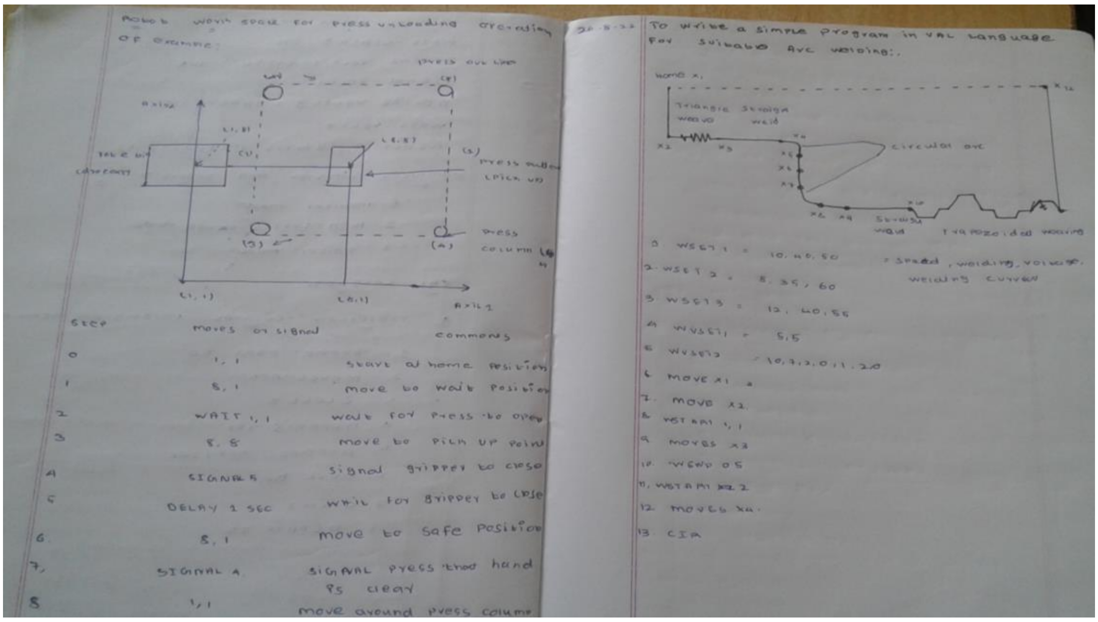
Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

Innovative Practice No: 10 Description

- **Module / Topic: Module 4 /** Robot Programming
- **Course Outcome:** CO 4
- **Activity Chosen: Class note**
- **Justification:**
  During teaching and discussion, students are taking notes using a note book. At the end of the class, if a teacher goes through the students' class notes, he or she can able to know the points observed by the students. The staff can use the observation for preparation of the next class.
- **Time Allotted for the Activity:** 10 Minutes
- **Details of the Implementation:**
  Students were asked to prepare their class notes during the teaching and discussion about robot programming. At the end of the class, students' class notes were collected and gone through by the staff.
- **Reflective Critique:**
  - ***Feedback of practice from students and other stakeholders:***
    The practice was well-received by students, who said it helped them remember subjects and substance while writing exams. They also noted that they have a good subject note for preparation of exams.
  - ***Benefit of the practice:*** (E.g.: Outcome attainment would have increased due to innovative practice over conventional practice)
    The Students eagerly participated in that activity and then they acquired the knowledge of robot programming. Due to this activity, the students were able to recall the topic and remember the important terms easily.
  - ***Challenges faced in implementation:***
    I have planned this activity for 10 minutes. Students had shown their class notes. But collecting referring all students class notes consume more time. So only few samples were collected and they were gone through.

- **Images / Screenshot of the practice:**





References:

- ❖ Groover, M.P. Industrial Robotics – Technology, Programming and Applications, McGraw- Hill, 2001.
- ❖ Klafter R.D., Chmielewski T.A and Negin M., Robotic Engineering - An Integrated Approach, Prentice Hall, 2003.

E.G.S. PILLAY ENGINEERING COLLEGE, NAGAPATTINAM.

Department of Mechanical Engineering

Academic Year 2023 – 2024 (Even Semester)

Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

Innovative Practice No: 11 Description

- **Module / Topic: Module 5 /** Robot project implementation in mechanical industries
- **Course Outcome:** CO 5
- **Activity Chosen: Think-pair-share**
- **Justification:**

  Think-pair-share (TPS) is a collaborative learning strategy where students work together to solve a problem or answer a question about an assigned reading. This strategy requires students to (1) think individually about a topic or answer to a question; and (2) share ideas with classmates. Discussing with a partner maximizes participation, focuses attention and engages students in comprehending the reading material.
  - It helps students to think individually about a topic or answer to a question.
  - It teaches students to share ideas with classmates and builds oral communication skills.
  - It helps focus attention and engage students in comprehending the reading material.
- **Time Allotted for the Activity:** 30 Minutes
- **Details of the Implementation:**

  T : (Think) I asked to think about “Robot project implementation in mechanical industries”. Students "thought" about what they know or have learned about the topic.

  P : (Pair) Each student paired with two to three students (their bench mates).

  S : (Share) Students shared their thinking with their partner. I expanded the "share" into a whole-class discussion.
- **Reflective Critique:**
  - ***Feedback of practice from students and other stakeholders:***

    The practice was well-received by students, who said it helped them remember subjects. They also noted that because they are discussing and presenting in front of all of the students, this activity boosts their confidence.

  - ***Benefit of the practice:*** (E.g.: Outcome attainment would have increased due to innovative practice over conventional practice)

    The Students eagerly participated in that activity and then they acquired the knowledge of “Robot project implementation in mechanical industries”. Due to this activity, the students were able to recall the topic and remember the important terms easily.

  - ***Challenges faced in implementation:***

    I have planned this activity for 30 minutes. Students take some time to discuss and present the topic. After formed the group, they discussed. Also they shared their discussion in front of others. So it takes another 15 minutes for completing the activity.

- **Images / Screenshot of the practice:**

References:

❖ Groover, M.P. Industrial Robotics – Technology, Programming and Applications, McGraw- Hill, 2001.

❖ Klafter R.D., Chmielewski T.A and Negin M., Robotic Engineering - An Integrated Approach, Prentice Hall, 2003.

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Academic Year 2023 – 2024 (Even Semester)

Degree, Semester & Branch: VI Semester B.E. MECH A & B
Course Code & Title: 1903ME010 -INDUSTRIAL ROBOTICS
Name of the Faculty member (s): Dr. S. Ramabalan

Innovative Practice No: 12 Description

- **Module / Topic: Module 5 /** Safety precautions in Robot projects
- **Course Outcome:** CO 5
- **Activity Chosen: Zero minute speech**
- **Justification:**
  First the staff teaches all topics in a module. At the end of completing a module in the syllabus, the staff asked a student to speak about a topic related to that module. Without taking time, the student has to speak about it.
- **Time Allotted for the Activity:** 15 Minutes
- **Details of the Implementation:**
  At the end of a class discussion, five students were asked to speak about a topic. Without any preparation time, the students spoke about the topic.
- **Reflective Critique:**
  - ***Feedback of practice from students and other stakeholders:***
    The practice was well-received by students, who said it helped them remember subjects and it will help them for preparing exams. They also noted that because they are speaking in front of all of the students, this activity boosts their confidence.
  - ***Benefit of the practice:*** (E.g.: Outcome attainment would have increased due to innovative practice over conventional practice)
    The Students eagerly participated in that activity and then they acquired the knowledge of robot safety precautions. Due to this activity, the students were able to recall the topic and remember the important terms easily.
  - ***Challenges faced in implementation:***
    I have planned this activity for 15 minutes. But students took more time to speak. So it takes another 15 minutes for completing the activity.

- **Images / Screenshot of the practice:**

References:

- Groover, M.P. Industrial Robotics – Technology, Programming and Applications, McGraw- Hill, 2001.

- Klafter R.D., Chmielewski T.A and Negin M., Robotic Engineering - An Integrated Approach, Prentice Hall, 2003.