

Preparing Students for Industry Success: Emphasis on MATLAB at PVG's College of Engineering and Technology & G.K. Pate (Wani) Institute of Management, Pune-411009 (India)

I firmly recommend MATLAB Campus Wide Licenses to other Institutions. You can acquire more than 100 toolboxes with the Campus-Wide License. Due to MATLAB's applications in a wide range of fields, including finance, automotive, electronics, electrical, mathematics, mechanical engineering, and medicine, you can use a multidisciplinary approach at your institution, which is completely in line with the government's New Education Policy

To help students become industry-ready, PVG encourages them to use MATLAB and earn certifications. DesignTech and MathWorks offer great support. DesignTech regularly conducts trainings for several departments.

Dr. Manoj Ramesh Tarambale (Principal – BE Electrical, ME Electrical Control System, Ph.D. Electrical)



PVG's College of Engineering and Technology & G.K.Pate (Wani) Institute of Management, Pune-411009.

Established in 1985, Pune Vidhyarthi Griha's College of Engineering and Technology, an affiliate to the Savitribai Phule Pune University and accredited 'A' by NAAC is one of the reputed engineering colleges in India.

Vidhyarthi Griha was established in 1909, by the group of dedicated and visionary social workers, primary aim being to provide education facilities to deserving students and facility deprived students. PVG's College of Engineering and Technology and G. K. Pate (Wani) Institute of Management was established as an unaided college in 1985 under the parent Institute PVG.

Challenge

Institute should be intentionally reinventing their curricula to make interdisciplinary a fundamental pillar of everything they teach in order to enable students to solve real-world problems, regardless of the career path they pursue.

“Nobody among us is capable of predicting how the world will develop or what types of jobs will emerge. But this is precisely the reason our institute should give students transferable skills and the intellectual ability to use them in new and unfamiliar circumstances. This will continue to be little more than a dream unless we fundamentally alter the way that we educate students” says **Dr. Manoj Ramesh Tarambale (Principal – BE Electrical, ME Electrical Control System, Ph.D. Electrical)**

Before 2019, PVG used a concurrent licensing for MATLAB, which restricted its use to a certain department as well as to selected students and faculty. The latest toolboxes could not be used by faculty or students since the license was not under maintenance.

MathWorks has a rich set of toolboxes which allow you to break down many complex problems. PVG’s main focus was to help all the students to do certifications, learn the latest toolboxes of their choice and be industry ready. We needed some alternative solution where every department could use MATLAB and all its toolboxes whenever and wherever required.

Project-Based Learning was something we wanted to include in our curriculum. The old educational approach of having students memorize information and then repeat out of context was no longer sufficient to prepare students to survive in today's world. Students must possess fundamental knowledge and 21st-century skills to solve extremely complex problems. With this set of abilities, students may take control of and manage their educational experience while being supervised and mentored by an expert faculty. We were aware of the benefits of MATLAB and how it might be used to assist students to improve their skills.

Solution

After knowing the exact challenge, we had in terms of the limitation of usage of the MATLAB license. PVG was approached by the DesignTech team in 2018. They understood our exact pain area and told us about MathWorks Campus Wide Licenses (CWL).

A Campus-Wide License provides unlimited use of MATLAB, Simulink, and online learning tools to all students, faculty, staff, and researchers, on and off campus, on any device. After going through the offering for MATLAB CWL license we found it to be very cost effective.

PVG purchased a CWL license in 2018 and immediately a separate on boarding session was conducted directly by the MathWorks team for all faculty and IT staff. MathWorks helped us to get MATLAB CWL deployed at our institute, create a customized MATLAB portal for the institute and deliver proactive communications to promote the usage of licenses to everyone on campus.

“From Limited License usage to unlimited license usage with more than 100 toolboxes catering to each and every stream of engineering, was the biggest benefit we received because of CWL” says **Prof. Ms. Nikita. D. Chaudhari (Assistant Professor, PVG)**

All departments displayed posters that were provided by MathWorks. The institute's awareness of CWL licences rose when we began the induction sessions in the first year, which is the common year for all engineering branches.

Right from the first year, we introduced students to MAOTS (MATLAB Academic Online Training suite). More than 25 certifications are available through the CWL. We advised students to begin online certification courses in their first year so that they will graduate from engineering prepared for the workforce.

Today in PVG more than 1000 students have installed MATLAB on their personal laptops

DIGITIZATION AND HOW MATLAB IS HELPFUL

Digital technologies are rapidly evolving and transforming the way we live, work, and organize things. From smart phones & watches to cloud based services signs of digitization are widely evident around us. Similarly, today, work across all domains has become highly dependent upon digital technologies and to be industry ready, students' must be equipped with the right set of digital skills.

PVG has started introducing these skill sets right from the 1st year of UG Program. We make students aware about these technologies and the industry demand. We also have incorporated Project-Based Learning (PBL) and we make students to use MATLAB department wise i.e., Electrical, E&TC, Mechanical, and Computer Science & IT.

Because of the increasing demand for AI, ML, Model-Based Design (MBD), Data Science & IOT, MathWorks has got some exceptional toolboxes like Statistics and Machine Learning, Deep Learning, Reinforcement Learning, predictive maintenance and Thing-Speak.

“More than 20 students got placed acquiring these skill sets in PVG “says Prof. Ms. Nikita. D. Chaudhari (Assistant Professor, PVG)

USAGE OF MATLAB DEPARTMENT WISE

PVG has a very organized method. Every department has a MATLAB mentor, as well as a faculty member, who is very familiar with and skilled at using MATLAB and Simulink. When students run into issues, faculty mentors assist them in finding solutions.

For technical engagements, we additionally engage MathWorks and DesignTech experts assistance. Based on demand, DesignTech conducts a minimum of 2–3 sessions per semester.

From the 1st year until the last, we provide each student with a unique login ID and password and maintain track of each student's license access.

E & TC Department:

In this department PVG uses MATLAB in subjects like Electrical circuits, Signal & Systems, Control Systems, and Digital Signal Processing. Faculty mentors take extra workshops and upload additional assignments so that students can complete certifications.

To analyse students' understanding, faculty gives problem statements to students at regular intervals. The solution to these problems is then attached as practical and included in students' journals. Faculty thus keeps motivating students to use MATLAB for finding solutions to practical problems across varied subjects of the department.

Faculty members especially encourage students to use MATLAB for projects focusing on embedded sensors. Working on embedded sensors using MATLAB has helped the students from E&TC department secure second rank in the prestigious Drone Design competition in the year 2019-2020. Toolboxes such as communication toolbox, WLAN, and 5G were useful to students while competing in the drone competition.

Electrical Department:

In the Electrical Department, the core studies are based on physical modelling like power electronics, control systems & power system analysis, etc. Practical sessions for core design subjects like embedded processors are conducted using MATLAB and Simulink in this department. This enables students and faculty members to design precisely and make design changes in a timely manner. Several toolboxes from MATLAB, like the MATLAB coder, embedded coder, Simscape, Simscape electrical, and control system, are beneficial to the students and faculty in various ways.

Mechanical Department:

The Mechanical Department specifically uses MATLAB for vehicle simulation and robot design. Every year, students from this department participate in highly competitive competitions like BAJA SAEINDIA and SUPRA SAEINDIA. Using MATLAB, students can make precise designs for such competitions and simulate those designs to get an exact understanding of how they will behave in real life.

Another benefit that students and faculty both derive using MATLAB is that they can directly approach the MathWorks team to find solutions to any problems they face.

Students use MATLAB to participate in ROBOCON, which is a highly prestigious competition for the mechanical department. ROBOCON competition requires designing many complex elements that requires making dimension calculations for every element and then simulating the entire project. Using MATLAB and Simulink, all calculations and design work becomes easy and students get a competitive edge over others.

Apart from project work, the department uses MATLAB for teaching subjects like finite element analysis, thermodynamics, engineering mathematics III, numerical methods & optimization, and various other subjects.

Printing Department:

Unlike other engineering courses, very few colleges in India offer undergraduate and postgraduate programmes in printing engineering; PVG is one of the few colleges that offers this program. Subjects such as digital printing techniques and colour science & measurement are taught using MATLAB in this department.

In packaging-related projects and assignments, MATLAB is used for identifying image quality, colour combinations, image segmentation, and digital image processing.

As far as I know, more than 95% of engineering students are actively using MATLAB to solve their assignments and projects. Says Prof. Ms Nikita. D. Chaudhari (Assistant Professor, PVG)

RESEARCH RELATED ACTIVITIES

MATLAB has various libraries available across different domains, making interdisciplinary connections smooth and easy. This further makes MATLAB and Simulink an excellent tool for building interfaces between different systems like mechanical systems, electronic systems, communication systems, and systems from many other disciplines. Making MATLAB an important software that unites all engineering and non-engineering disciplines together, powering innovation and technology.

"According to me, this makes MATLAB the most powerful tool, which students from all engineering backgrounds must use," says Dr. Manoj Ramesh Tarambale (Principal – BE Electrical, ME (Electrical Control System, Ph.D. Electrical)

Referring multiple research papers published internationally by students and faculty members across different countries, it can be concluded that using MATLAB and Simulink helps have better flexibility, accuracy, and precision to prove test results.

Likewise, in PVG, students from postgraduate and PhD programmes heavily rely on MATLAB and Simulink to conduct their research studies.

In one of the major researches conducted by Dr. Manoj Ramesh Tarambale (Principal – BE Electrical, ME (Electrical Control System, Ph.D. Electrical), he found that identifying and detecting cancerous tumours becomes simplified using MATLAB. In MATLAB after image processing AI helps in detecting tumours, which otherwise is a very difficult task.

Results

Giving Students a Competitive Edge: MATLAB improves the efficiency and accuracy of calculations. Participating in a student competitions based on embedded sensors, the E&TC department students secured a second rank. The students from the Mechanical department used MATLAB and Simulink to participate in BAJA SAEINDIA, SUPRA SAEINDIA, and ROBOCON competitions. Designing complex elements of a robot and having its real-time simulation helped students hugely while contesting in the competitions.

Making Students Industry Ready: In these rapidly evolving modern times with tremendous dependency on digital skills, PVG encourages students to learn and master MATLAB. Students are motivated to complete 25 plus MATLAB certifications. Faculty members organize a minimum of 2-3 sessions with DesignTech whenever needed to help students use MATLAB and get introduced to the latest features of the software. Students are also urged to use MATLAB and Simulink while working on their projects and participating in competitions. This helps students get exposure to real-world problems and gives them practical hands-on experience in working on them making them industry ready.

More Students Get Access to MATLAB: Earlier only a select few departments and students had access to MATLAB and Simulink keeping the total percentage of MATLAB users less than 10% of the campus population. With Campus Wide License the number of student and faculty users has now increased to nearly 95%. Students right from their first year can now use MATLAB and become industry competent.

Interdisciplinary Approach Achieved: MATLAB provides a very smooth interface, facilitating interdisciplinary connections across different departments in PVG. Students from Mechanical, electronics, E&TC, and other departments can now work together on hybrid projects that require expertise from two or more engineering fields and develop innovative technologies.
