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KIET leverages MATLAB to help strengthen complex engineering concepts for students

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KIET group of Institutions

Established in 1998 by the Krishna Charitable Society with a modest enrolment of 180 students, the KIET Group of Institutions has evolved as a pioneer in technical education within the Delhi NCR region. Affiliated with Dr. A.P.J. Abdul Kalam Technical University, Lucknow, Uttar Pradesh, KIET Group of Institutions holds the prestigious accreditation of Grade 'A+' from the National Assessment and Accreditation Council (NAAC).

Furthermore, its diverse range of programs, including Computer Science and Engineering (CSE), Electronics and Communication Engineering (ECE), Electrical and Electronics Engineering (EEE), Information Technology (IT), Mechanical Engineering (ME), Civil Engineering (CE), Master of Computer Applications (MCA), Master of Business Administration (MBA), and Pharmacy, have received accreditation from the National Board of Accreditation (NBA).

Challenges

According to Dr. Rochak Bajpai, Assistant Professor, ECE Department at KIET Group of Institutions, the primary challenge faced by students at the institute was clearing their fundamentals. In the absence of software like MATLAB and relying solely on a whiteboard and markers, students found it challenging to visualize complex engineering concepts. Despite their interest in terms like AI, ML & DL, Robotics and IoT, students were unable to progress quickly without a solid fundamental understanding of how systems function and communicate.

Another obstacle encountered by faculty members was the limited access to MATLAB software due to the absence of campus-wide license (CWL). The software was only available to a few faculty members, leaving students without access. Moreover, using MATLAB on different devices required a cumbersome data transfer process each time, making it a difficult task.

In the absence of CWL, many faculty members turned to open-source alternatives which had its own set of limitations. For instance, these software's suffered from limited resources, while some users were constrained to using a predefined library system.

Solutions

After the pandemic, KIET acquired campus-wide license (CWL) for MATLAB. This license has significantly enhanced accessibility, allowing all faculty members and approximately 3000-4000 B. Tech. students to easily access the MATLAB software.

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The utilization of MATLAB has enabled students to visualize concepts and grasp fundamental principles more effectively than relying on traditional memorization methods. They now comprehend in a better way how sensors operate, how systems are designed and integrated, and in machine learning, they understand how data is trained to operate on specific machines. This advancement has empowered students to excel academically, actively participate in competitions, and undertake advanced projects.

With the CWL in place, all faculty members can concurrently use MATLAB on college desktops and their laptops. MATLAB's cloud storage feature has streamlined the process for both faculty and students, facilitating seamless software usage across various devices without the hassle of a cumbersome data upload process.

The Usage of MATLAB across Different Subjects and Departments at KIET

"MATLAB provides excellent computation tools to work upon problems, if you have a certain mathematical background, you can seamlessly use MATLAB for various projects and derive their solutions", says Dr. Rochak Bajpai, Assistant Professor ECE Department at KIET Group of Institutions.

In the ECE department, MATLAB is integrated into the syllabus starting from the second year, particularly in courses such as signal processing, digital signal processing, and communication engineering. This inclusion ensures that students gain substantial exposure to MATLAB, supported by experiments specifically tailored to familiarize them with the software. For instance, in subjects like modulation processes, MATLAB assists teachers in demonstrating the generation of modulated signals and their corresponding outputs.

In both the fourth and sixth semesters, as part of the regular curriculum, labs in Communication Engineering, Digital Processing, and Control Engineering offer various experiments centered around MATLAB. The entire ECE department has four labs associated with MATLAB, seamlessly integrated into the standard curriculum. Similarly, the Electrical Engineering department features 3-4 labs related to MATLAB, also the design of three-phase systems is executed using

MATLAB in the department. In ECE, Electrical, and Electronics departments KIET has dedicated MATLAB with a capacity of 30 students each.

In the CSE department, network simulation problems and image processing challenges are exclusively solved using MATLAB. Students in the CSE department utilize MATLAB extensively for project work related to image processing subjects.

Moving to the Mechanical department, students leverage Simulink, for designing friction and mechanical systems to develop actual system designs. Most faculty members have found ways to incorporate MATLAB into campus activities, showcasing its versatile application in various departments.

Awareness Measures KIET Undertakes to Introduce MATLAB to students and Faculty

At KIET, a centralized email process is in place to inform faculty and staff members about MATLAB and other campus systems. Additionally, a hierarchical method is used by the management to spread awareness. Each department maintains a WhatsApp group where the Head of the Department (HOD) and other members actively participate. Furthermore, three class advisors, who also serve as class representatives, use platforms like WhatsApp to inform all students about MATLAB.

For any queries, students can reach out to a centralized system managed by the institute's IT department. These queries or problems are then directed to Dr. Hunny Pahuja who oversaw the entire execution of MATLAB and MathWorks on campus. Dr. Hunny personally addresses and resolves any MATLAB-related queries. This centralized approach allows students from all departments to seek solutions for their queries.

During lectures and practical sessions, faculty members and the HOD ensure that information about MATLAB and the Online Training Suite (OTS) of MathWorks is shared with students. Faculty members encourage students to complete the basic course of MATLAB and Simulink, and upon completion, students receive certificates, motivating them to finish the course. When students face problems, such as mechanical students struggling with programming or CSE students with computer science instruments, they approach the HOD or faculty coordinator. The faculty then informs them about various certificate courses available on OTS that could be beneficial for them.

Likewise, to familiarize students with various MathWorks toolboxes, numerous experiments are conducted, encouraging students to actively utilize these toolboxes. For instance, in experiments related to image processing, students are tasked with selecting the appropriate image processing toolbox. In many cases, students independently determine the suitable toolbox for the task, and if they encounter difficulties, faculty members are readily available to assist them. This hands-on approach empowers students to engage with the tools and fosters a problem-solving mindset, with faculty guidance readily accessible when needed.

Application of MATLAB Outside of Class Assignments

At KIET Dr. Rochak Bajpai, has personally used MATLAB extensively during his M. Tech. and Ph.D. studies. He used MATLAB for configuring power transfer in various channels. Also, a faculty member from the ECE department at KIET is currently exploring how to integrate open source software’s with MATLAB. KIET also has specialized labs, including a Space Lab, Robotics Lab, and Signal Processing Lab, where students actively use MATLAB for simulation work. This involves utilizing MATLAB for primary simulations to understand the functioning of various systems.

Dr. Rochak also suggests that for mechanical students, designing Supra and other competitive projects initially on SIMULINK could significantly enhance their understanding. Transitioning from simulation to physical design could provide a more comprehensive learning experience for them.

Support Provided by Design Tech and MathWorks

“DesignTech has been exceptionally helpful in this regard. Whenever we requested information or assistance at the beginning of each semester, they promptly provide valuable insights to our students. What's truly surprising is that, despite their busy schedule, DesignTech consistently makes technical experts available and dedicates sufficient time to our college. Our experience with them in the software scenario has been truly positive and enriching”, says Dr. Rochak Bajpai, Assistant Professor ECE Department at KIET Group of Institutions.

Measure of Success for KIET

According to Dr. Rochak the real measure of success will be, when more students across the campus use MATLAB in their projects and start using it to develop designs and technologies to solve real world problems.

Results

1. Students have friction free access to MATLAB across the campus. Nearly 3000-4000 students alone on the B.Tech. course are now able to use MATLAB on their mobile phone in addition to their laptops.
2. Students have better understanding of basic principles and fundamental engineering concepts allowing them to better grasp digital tools like AI, ML, DL, IoT and others.
3. Students as well as faculty can use MATLAB anytime, anywhere.