



EXTENDED ABSTRACT



InViCCAD 2025
1ST INTERNATIONAL VIRTUAL COMPETITION OF CREATIVE
ARTS & INNOVATIVE DESIGN IN TEACHING & LEARNING



Design Innovation Academic Show 2025



Organized by



Fakulti
Seni Lukis & Seni Reka
Cawangan Kedah



اوسها تقوى موليا

Collaboration with



#perubahanluarbiasa
#ADpilihanpertama



**EXTENDED
ABSTRACT**

**Design
Innovation
Academic
Show 2025**





DIAS 2025 (Design Innovation Academic Show) is all about "Transcending the Boundaries of Creativity: Innovation in Art & Design for 21st Century Education." This vibrant program shines a spotlight on how creativity and innovation are reshaping modern education.

It consists of three key components. First up is the Mindareka Design Show, an exhibition that showcases students' final year projects and creative designs, giving them a chance to connect with industry professionals and the wider community. Next, we have the Northern Innovation Academic Tour (NIAT), which takes participants on an academic adventure to select institutions and innovation centers in the northern region, aimed at promoting knowledge sharing and building strong academic and professional networks.

Finally, there's the 1st International Virtual Competition of Creative Arts & Innovative Design in Teaching & Learning (InViCCAID), a global competition that recognizes outstanding practices in teaching and learning by blending art, technology, and innovative design. But DIAS 2025 is more than just a talent showcase; it's a powerful platform for empowering both students and educators, while also strengthening collaborations between universities, creative industries, and global communities. With its inclusive and interdisciplinary approach, this initiative strives to spark relevant, competitive, and impactful ideas and innovations that truly benefit society and push the future of education forward.



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Design
Innovation
Academic
Show 2025



Prof. Dr. Roshima Haji Said
Acting Rector
UiTM Kedah Branch

Rector's Message

I am delighted to extend my heartfelt congratulations to the College of Creative Arts, UiTM Kedah Branch, for bringing MINDAREKA 2024 - Unleashing Your Visual Creativity to fruition. The triumphs of past MINDAREKA editions undoubtedly fueled the organization of this year's event, making MINDAREKA 2024 a reality.

MINDAREKA 2024 - Unleashing Your Visual Creativity stands as a testament to the dedication of students at the College of Creative Arts, UiTM Kedah Branch, providing them with a platform to showcase their final art projects. Beyond serving as a space for the exploration of fresh, innovative, and entrepreneurial concepts, this exhibition is poised to connect aspiring talents with potential clients and employers.

I extend my sincere gratitude to all participants whose enthusiasm and support have contributed to the success of MINDAREKA 2024 - Unleashing Your Visual Creativity. Their unwavering belief and commitment have truly brought this event to life, marking it as a resounding triumph!





Head of Faculty Message

It is an honour to introduce DIAS 2025 – Design Innovation Academic Show, held under the theme “Transcending the Boundaries of Creativity: Innovation in Art & Design for 21st-Century Education.” This significant event reflects the faculty’s ongoing commitment to fostering a culture of innovation, critical thinking, and creative exploration among our students and academic community. As we navigate the complexities of the 21st century, it becomes increasingly clear that education must go beyond traditional boundaries to embrace multidisciplinary approaches that are both relevant and future-forward.

The three core components of DIAS 2025, Mindareka Design Show, Northern Innovation Academic Tour (NIAT), and the 1st International Virtual Competition of Creative Arts & Innovative Design in Teaching & Learning (InViCCAID) which is serve as vital platforms to highlight the convergence of design, technology, and pedagogy. These initiatives not only empower our students to showcase their talents and ideas, but also create opportunities for engagement with industry leaders, academic peers, and global collaborators. The Mindareka Design Show celebrates student creativity and innovation through compelling final year projects. NIAT fosters knowledge sharing and institutional partnerships through academic visits and exchanges, while InViCCAID offers international recognition for excellence in integrating art and design into teaching and learning.

I would like to express my deepest appreciation to the organising committee, faculty members, students, and strategic partners who have worked tirelessly to bring this programme to life. Your dedication and collaborative spirit have made DIAS 2025 a reality and a reflection of our shared vision for transformative education. It is my hope that this platform will continue to inspire meaningful dialogue, cultivate groundbreaking ideas, and spark a new wave of innovation that enriches both education and society.



Mohamat Najib Mat Noor
Head of Faculty
Faculty of Arts & Design
UiTM Kedah Branch





**Industrial
Design
(Bachelor)**





MOBIX | TRASTIBIAL LEG

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ABSTRACT

This project introduces the development of a transtibial prosthetic leg designed to improve the quality of life for individuals with below-knee amputations, particularly those engaged in self-employment or home-based work. The design focuses on addressing the unique needs of users who rely on mobility for everyday productivity while requiring a prosthesis that is comfortable, lightweight, and easy to maintain. The prosthesis is constructed using a titanium pylon, offering superior strength and corrosion resistance with minimal weight. A carbon-fiber reinforced, 3D-printed socket provides a custom fit tailored to the user's limb, optimizing pressure distribution and reducing skin irritation. For foot mechanics, a carbon-fiber composite spring blade is employed to simulate the energy return and fluid motion of a natural human gait. To enhance comfort during long hours of wear, a ventilated cosmetic cover is integrated, promoting airflow and reducing heat buildup inside the socket. An adjustable knee joint is incorporated to provide enhanced mobility during walking, sitting, and standing—accommodating the varying postures and activities common in small-scale work environments. The modular design also ensures that components can be easily replaced or adjusted for individual needs. This user-centered design demonstrates how thoughtful integration of materials, structure, and function can result in a prosthetic leg that is not only biomechanically effective but also tailored for real-world usability. It reflects a balance between medical functionality and daily lifestyle support, promoting both physical mobility and economic independence.

Keywords: Transtibial Prosthesis, Adjustable Knee Joint, Lightweight Design, Titanium Pylon, Carbon Fiber Socket, Breathable Cover, Ergonomic Mobility

INTRODUCTION

The transtibial prosthetic leg project focuses on delivering a practical mobility solution for individuals with below-knee amputations who work in home-based or small business environments. These users often face challenges that standard prosthetics do not address, such as the need for prolonged standing, reliable support during daily tasks, and comfort in warm conditions.

This design aims to bridge the gap between medical functionality and real-world usability by emphasizing comfort, adaptability, and durability. The prosthesis incorporates a carbon-fiber reinforced 3D-printed socket, a titanium pylon, a dynamic spring-blade foot, and a ventilated cosmetic shell. Each component is selected and engineered to reduce fatigue, promote airflow, and enhance biomechanical performance.

By focusing on ergonomics, breathability, and structural integrity, this design addresses the specific lifestyle demands of users who are economically active and need a prosthetic device that supports both movement and stability. The project combines engineering with empathy, delivering a solution that promotes independence and daily productivity.

MATERIAL AND FINAL DESIGN 3D



Figure 1.1 The picture of material



The material selection for this transtibial prosthetic leg is guided by the goal of maximizing strength, comfort, and efficiency while maintaining a lightweight profile suitable for long-term daily use. Each material in this prosthetic system was selected and integrated with the specific needs of home-based or economically active transtibial amputees in mind. The combination offers a durable, flexible, and breathable solution that enables reliable, day-long mobility. The prosthetic leg components are developed through a modular design system. The socket is custom-scanned and 3D-printed to match user anatomy, reducing pressure points. The pylon is titanium joined to a spring-blade foot with durable flex hinges. A ventilated cover is formed using thermoforming techniques and perforated strategically for breathability.

The prosthetic leg is developed through a modular design approach that prioritizes user adaptability and long-term wearability. The first step involves custom scanning of the user's residual limb to capture precise anatomical data. This scan is used to generate a digital model for the socket, which is 3D-printed using carbon-fiber reinforced material to provide a snug and durable fit.

The titanium pylon is machined to tight tolerances and serves as the main structural shaft connecting the socket to the foot. It is fixed using medical-grade bolts and flex joints that absorb shock and enhance stability. The foot assembly features a carbon-fiber composite spring blade, which is tuned to the user's weight and gait pattern, enabling energy-efficient walking.

The ventilated cosmetic cover is fabricated using thermoforming techniques. Strategic perforations are introduced using laser-cutting to enhance breathability and reduce heat buildup. This modular construction allows each part to be replaced or serviced independently, ensuring long-term usability and ease of maintenance.



Figure 1.2 The picture of 3D final design

The 3D final design of the transtibial prosthetic leg is digitally modeled using 3D rhinoceros' tools and presented through various views, including top, front, side, and isometric perspectives. These views showcase the integration of form, function, and comfort. The side view emphasizes the dynamic profile of the spring-blade foot and the alignment of the pylon to ensure efficient energy transfer. The front view highlights the symmetrical ventilation patterns on the cosmetic shell and the anatomical shaping of the socket.

From the top view, the socket reveals its ergonomic curvature, contoured to match the user's residual limb for optimal pressure distribution. The isometric view presents the prosthesis as a cohesive unit—demonstrating how each material interacts aesthetically and mechanically. Special attention is given to the adjustable knee joint, which is illustrated in different bending positions to highlight its role in supporting real-world movements such as crouching, walking, or sitting.

Collectively, the 3D renderings reflect a streamlined, lightweight prosthesis with smooth surfaces and thoughtful detailing. The clean interface between components ensures ease of assembly and maintenance, while the modular connections enable future upgrades. The design language balances technical performance with a modern, discreet aesthetic suitable for daily wear in professional or casual settings.

RESULTS AND DISCUSSION/FINDINGS

Evaluation of the prosthetic leg's components and configuration shows its viability in terms of ergonomic performance, material efficiency, and user adaptability. The titanium pylon and spring blade foot ensure smooth and reliable load transfer during walking cycles. The 3D print socket reduces bulk and provides secure suspension with improved heat management due to the breathable outer shell.

Tests and mock fittings with simulated movements demonstrated improved comfort, reduced fatigue, and greater flexibility. The ventilated cover design especially contributes to wearability over long durations in warm conditions. The adjustability of the knee joint further enhances the usability of the prosthesis in real working scenarios.

CONCLUSION & RECOMMENDATION

The final transtibial prosthetic leg design successfully meets the objectives of supporting daily mobility for below-knee amputees engaged in home-based or economic activities. Its material selection, ergonomic shaping, and ventilated construction make it suitable for extended wear and regular use.

For future improvement, additional features such as shock absorbers or sensor-integrated joints could be explored to further align motion with natural gait. In conclusion, this design presents a practical, comfortable, and user-friendly solution that enhances the quality of life and working potential for its intended users.

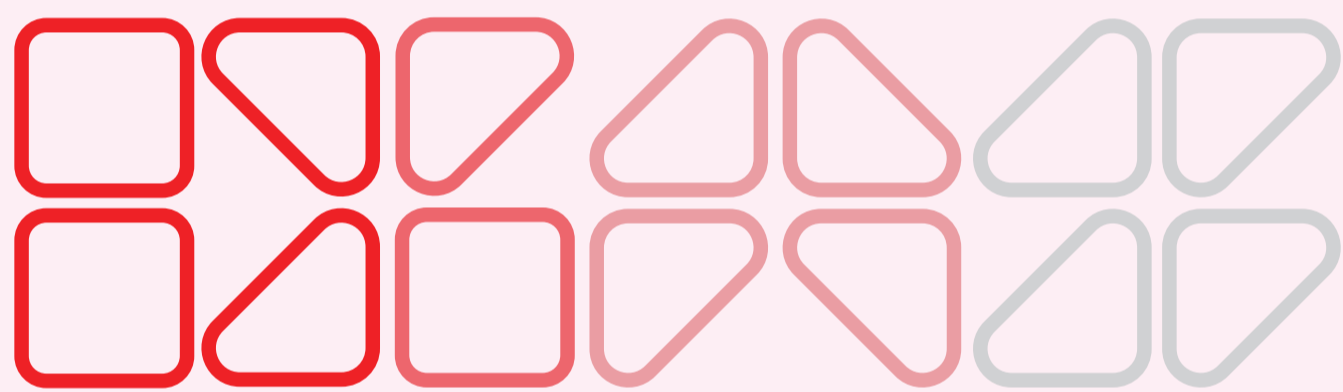


Figure 1.4 The picture of Environment at home (MOBIX)



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