

UNICATS 2026



UNIMAS COMPILATION OF ADVANCED THERMODYNAMICS STUDENT PROJECTS 2026

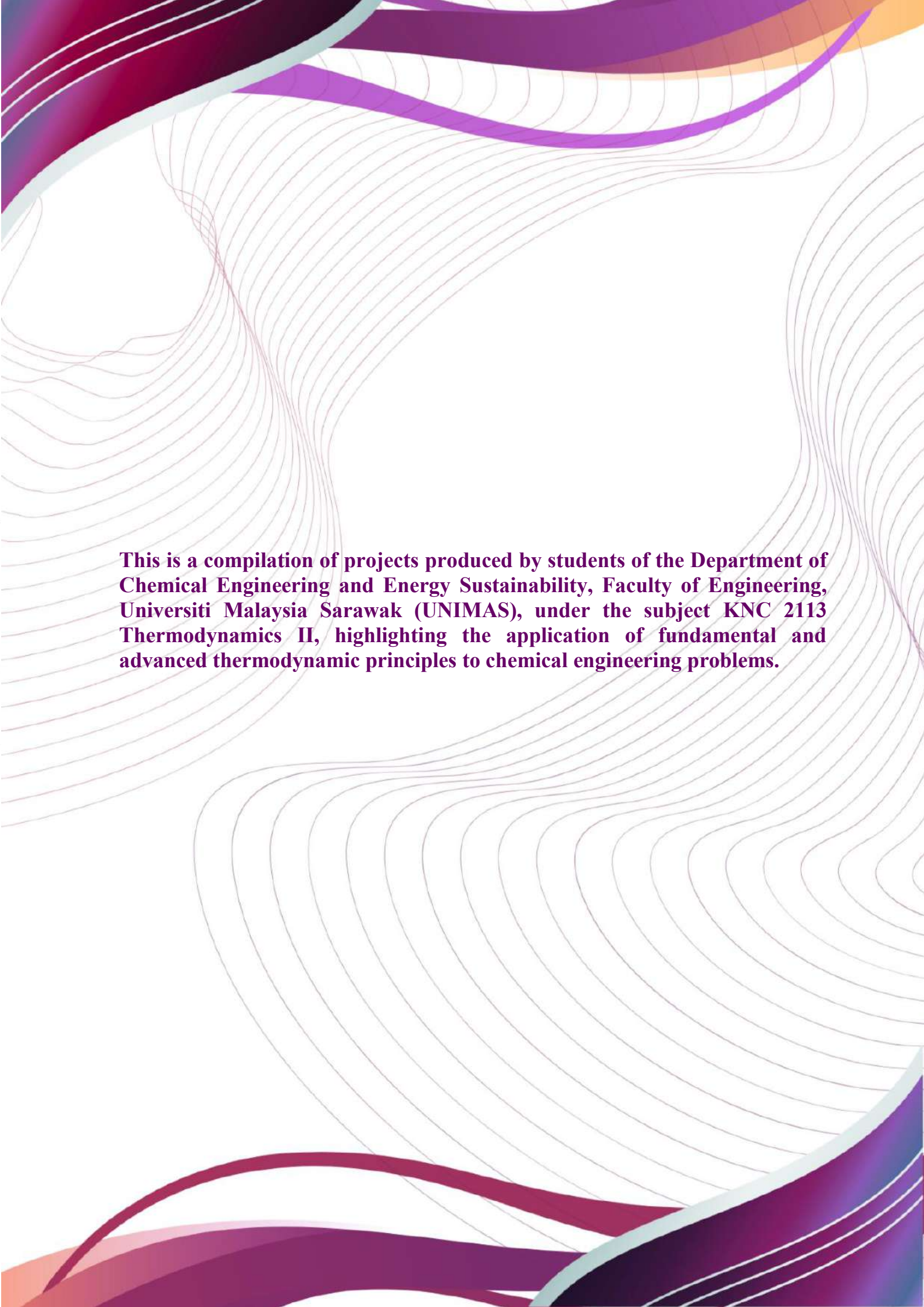
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This is a compilation of projects produced by students of the Department of Chemical Engineering and Energy Sustainability, Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS), under the subject KNC 2113 Thermodynamics II, highlighting the application of fundamental and advanced thermodynamic principles to chemical engineering problems.

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STUDENT PROJECTS 2026**

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Department of Chemical Engineering and Energy Sustainability, Faculty of Engineering, Universiti
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UNIMAS Compilation of Advanced Thermodynamics Student Projects 2026

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This is a compilation of projects produced by students of the Department of Chemical Engineering and Energy Sustainability, Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS), under the subject KNC 2113 Thermodynamics II. The compilation highlights the application of both fundamental and advanced thermodynamic principles to chemical engineering problems, demonstrating the integration of theoretical knowledge with practical problem-solving in the field.

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Foreword



Dr Nazeri Abdul Rahman

Chief Editor

*UNIMAS Compilation of Advanced
Thermodynamics Student Projects 2026
(UniCATS)*

Assalamu'alaikum warahmatullahi wabarakatuh and salam sejahtera.

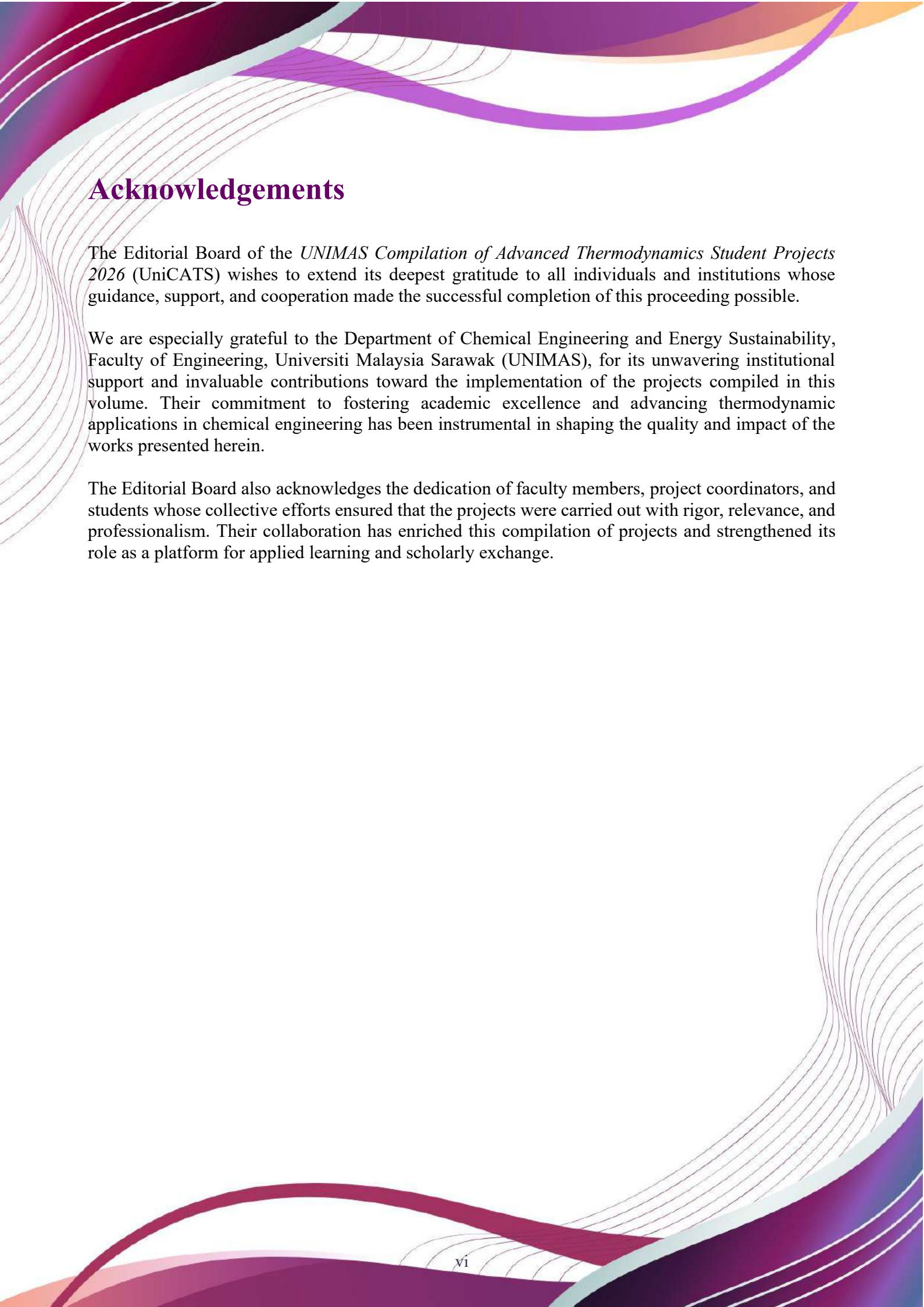
Welcome to the *UNIMAS Compilation of Advanced Thermodynamics Student Projects 2026* (UniCATS).

First and foremost, this compilation presents student-led projects that apply fundamental and advanced thermodynamic principles to chemical engineering problems. A strategic approach to strengthen chemical engineering education at UNIMAS is to engage students in well-guided, mentor-supported, and industry-relevant projects. Within the Department of Chemical Engineering and Energy Sustainability, Faculty of Engineering, students conduct investigations that integrate theoretical knowledge with practical applications, using modern tools such as Aspen simulation to model and optimize chemical processes. The outcomes presented in this compilation demonstrate the role of research-based projects as an effective platform for applied learning and professional skill development.

Driven by this educational priority, the compilation compiles scientific projects undertaken by KNC 2113 Thermodynamics II students during the academic session. In this compilation, the knowledge contributions are organized into three main research areas: vapour–liquid equilibrium (VLE) studies, and process optimization projects. Across these areas, the projects strengthen students' evidence-based reasoning, simulation proficiency, and scientific communication, while supporting responsible engineering decision-making.

A further contribution to this compilation of projects is its collaborative project structure, linking classroom instruction with guided project implementation. Postgraduate students serve as project coordinators, guiding students step-by-step, helping organize and monitor the projects, and supporting them in presenting their findings clearly in ways that connect theory to industrial practice.

We hope this compilation of projects will nurture sustained interest in thermodynamics among chemical engineering students by showing that scientific investigation is accessible, purposeful, and professionally relevant.



Acknowledgements

The Editorial Board of the *UNIMAS Compilation of Advanced Thermodynamics Student Projects 2026* (UniCATS) wishes to extend its deepest gratitude to all individuals and institutions whose guidance, support, and cooperation made the successful completion of this proceeding possible.

We are especially grateful to the Department of Chemical Engineering and Energy Sustainability, Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS), for its unwavering institutional support and invaluable contributions toward the implementation of the projects compiled in this volume. Their commitment to fostering academic excellence and advancing thermodynamic applications in chemical engineering has been instrumental in shaping the quality and impact of the works presented herein.

The Editorial Board also acknowledges the dedication of faculty members, project coordinators, and students whose collective efforts ensured that the projects were carried out with rigor, relevance, and professionalism. Their collaboration has enriched this compilation of projects and strengthened its role as a platform for applied learning and scholarly exchange.

Preface

The *UNIMAS Compilation of Advanced Thermodynamics Student Projects 2026* (UniCATS) is an academic initiative designed to strengthen chemical engineering education through structured, project-based learning. This compilation of projects provides a platform for students to apply both fundamental and advanced thermodynamic principles to real-world chemical engineering problems, fostering inquiry-based learning, simulation proficiency, and evidence-driven analysis. In line with this purpose, the compilation of projects nurtures scientific thinking, teamwork, and communication skills while reinforcing the integration of theoretical knowledge with practical applications.

This volume compiles twenty student-led projects undertaken under the subject *Thermodynamics II* at the Department of Chemical Engineering, Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS). Vapour-Liquid Equilibrium (VLE) is a fundamental concept in chemical engineering that underpins many industrial processes involving the simultaneous existence of liquid and vapour phases. Hence, each project emphasizes the application of chemical process that involves vapour-liquid equilibrium, in which produces both liquid and gas product, with Aspen simulation software serving as a key tool for modelling. In addition, the project also required students to optimise the process in term of product yield efficiency. Collectively, these works highlight the importance of thermodynamics in chemical engineering practice and demonstrate how students can bridge classroom knowledge with industrial relevance.

This compilation of projects presents each project as a distinct contribution. Together, these twenty studies showcase the diversity of thermodynamic applications—from chemical processes and modelling to process optimization and improvement strategies. The compilation provides a structured record of student investigations, simulation outputs, and recommendations for chemical engineering practice.

The primary purpose of this compilation of projects is to demonstrate that advanced thermodynamic projects can be effectively integrated into undergraduate education, where early exposure to simulation tools and applied problem-solving is essential. Therefore, by documenting these student-led projects, the compilation of projects underscores the relevance of thermodynamics to industrial practice and highlights the role of project-based learning in nurturing professional competencies among students.



UniCATS 2026

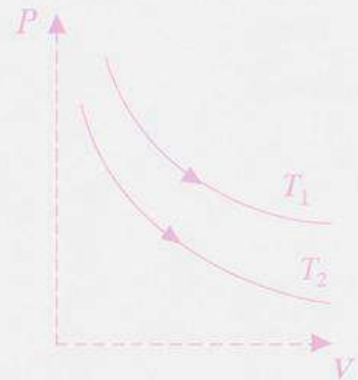
UNIMAS Compilation of Advanced
Thermodynamics Student Projects

UniCATS 2026 presents a compilation of student projects developed as part of the **KNC 2113 Thermodynamics II** course at the Faculty of Engineering, Universiti Malaysia Sarawak.

This collection showcases the application of fundamental thermodynamic principles to contemporary engineering problems while highlighting students' analytical thinking, computational proficiency, problem-solving skills, and ability to translate theoretical knowledge into practical engineering solutions.

KNC 2113 Thermodynamics II

Department of Chemical Engineering and Energy Sustainability
Faculty of Engineering, Universiti Malaysia Sarawak



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