

THE PROFESSIONAL LEGACY OF PROFESSOR JÓZSEF FARKAS

Structural Optimization, Welded Structures, and Economical Engineering Design

Centenary Study in Anticipation of the 100th Anniversary of His Birth

József Farkas

15 December 1927 – 15 September 2016

Miskolc, 2026

Biographical Overview

The career of József Farkas (1927–2016) was intertwined with the history of the University of Miskolc for virtually its entire duration. Trained as a civil engineer, he joined the still young institution of higher technical education in Miskolc and, for more than six decades, helped shape the teaching of metal structures, welded structures, and structural optimization in Hungary as a lecturer, researcher, supervisor, and professor emeritus. His work brought classical mechanics, structural stability, welding technology, and mathematical optimization together into a unified engineering approach. [1,17,23]

Biographical Data and Early Career

Item	Details
Birth	15 December 1927, Eperjes (now Prešov, Slovakia)
Death	15 September 2016
Degree	Diploma in Civil Engineering, Budapest University of Technology, 1950
University of Miskolc	Academic staff member from 1950; Department of Mechanics, 1950–1959; from 1959, departments concerned with conveying machinery, later materials handling and logistics
Academic degrees	CSc, 1966 – design of stiffened plates; DSc, 1978 – optimum design of metal structures
Professor	From 1975
Professor emeritus	From 1998; continued teaching and research after retiring in 1996

He began working in Miskolc in 1950, the year he obtained his civil engineering degree in Budapest. During his first nine years, teaching and research in mechanics formed the institutional basis of his work. From 1959 onward, he worked in departments concerned with conveying machinery and subsequently materials handling and logistics. This change proved decisive: mechanical theory came into direct contact with practical industrial problems involving cranes, conveying equipment, machine frames, and other load-bearing metal structures. [1]

Throughout his teaching career, he contributed to the development of courses on metal and welded structures and was involved for many years in postgraduate specialist training in welding engineering. A distinguishing feature of his approach was that structural components were assessed not only for their static load-bearing capacity but also with respect to dynamic effects, stiffness, vibration damping, stability, and manufacturability. He made difficult theoretical relationships comprehensible through engineering examples and comparisons of structural alternatives. [1]

Academic Degrees and the Path Towards Optimum Design

In 1966, he defended his Candidate of Sciences dissertation on the design of stiffened plates. This field of research naturally led him to questions of structural stability, plate buckling, stiffening systems, and the economical configuration of structural alternatives. In 1978, he obtained the Doctor of Sciences (DSc)

degree with a dissertation on “Optimum Design of Metal Structures.” An expanded version of this work formed the basis of the English-language monograph *Optimum Design of Metal Structures*, published in 1984, which became one of the foundational works establishing the international visibility of the Miskolc school of structural optimization. [1,2]

Career, Research School, and International Presence

The research school associated with Farkas developed gradually over several decades. Within the research group and the doctoral projects associated with it, work on stiffened plates, welding-induced residual stresses and deformations, stability phenomena, tubular and shell structures, vibration damping, and cost-based structural optimization became increasingly interconnected. One distinctive feature of this school was the effort, wherever possible, to validate calculations against laboratory or industrial measurements and to formulate optimization problems for real structures. [1,3–6]



Biographical timeline. Major milestones in the career of József Farkas. Source: compiled by the author [1,17,22,23].

His Role in Establishing a Research School

The Miskolc research group in metal structures and structural optimization produced several specialists who later established independent research careers. Contemporary retrospective accounts mention Imre Tímár, Károly Jármái, Ferenc Orbán, Sándor Rácz, László Szabó, Ferenc Szabó, and György Kovács among the members of the engineering and optimization community closely associated with him. His influence, however, extended beyond his direct students: the methods reached a broad engineering audience through industrial consultancy reports, continuing education, conferences, and international cooperation. [1]

International Connections and Professional Recognition

For nearly two decades, József Farkas participated in the work of the International Institute of Welding (IIW) as a Hungarian delegate. He was also a founding member of the International Society for Structural and Multidisciplinary Optimization (ISSMO). Through international conferences, publications, and collaborations, the Miskolc research community established links with specialists in Japan, Europe, North America, and South Africa. [1,5,19]

His professional distinctions included the Pattantyús Medal of the Scientific Society for Mechanical Engineering and the Apáczai Csere János Award. The University of Miskolc recognized his 45 years of service with a commemorative medal and conferred an honorary doctorate upon him in 2002. In 2015, the City of Miskolc awarded him the Gálffy Ignác Lifetime Achievement Award in recognition of his scientific and public contributions. [1,17]

Activity After Retirement and Personal Interests

His retirement in 1996 did not bring his professional activity to an end. As professor emeritus, he continued to give lectures, advise students on design assignments, and mentor doctoral candidates. In 1999, using his own resources, he established the foundation “Structural Optimization at the University of Miskolc” (Szerkezetoptimalás a Miskolci Egyetemen).

Alongside his scientific work, classical music was a major personal interest. He played the organ and synthesizer, wrote articles and books on musical subjects, and shared musical recordings with colleagues and acquaintances. [1,17]

The last major Hungarian-language synthesis of his professional work was the volume *Fémszerkezetek innovatív tervezése* (Innovative Design of Metal Structures), co-authored with Károly Jármái and published in 2015. The book encapsulates a central message of his career: a modern engineering structure can be regarded as well designed only when it is safe, manufacturable, and economical. [22]

Selected Books and Their Contribution to His Professional Legacy

The continuity of his professional career is reflected in the textbooks and English-language monographs on optimization through which he conveyed knowledge to several generations. Across these works, the integrated treatment of structural analysis and synthesis, stability verification, welding technology, and eventually manufacturing cost became increasingly prominent. [1–5,22]

Year	Work	Significance
1974 / 1983	Fémszerkezetek (Metal Structures)	University textbook; a foundation for teaching metal and welded structures
1984	Optimum Design of Metal Structures	International synthesis of his DSc research; a foundational work of the structural optimization school
1997	Analysis and Optimum Design of Metal Structures	Integrated treatment of analysis, stability, and optimum structural design
2003	Economic Design of Metal Structures	Strong emphasis on incorporating manufacturing costs into economical structural decisions
2008	Design and Optimization of Metal Structures	Modern optimization methods and a broad range of engineering applications
2013	Optimum Design of Steel Structures	Synthesis of several decades of research; Springer monograph
2015	Fémszerkezetek innovatív tervezése (Innovative Design of Metal Structures)	Comprehensive Hungarian-language synthesis, co-authored with Károly Jármái

Contemporary accounts differ as to the exact number of his publications, but all report several hundred scientific papers. A substantial proportion of these works appeared in foreign languages, above all English, which played a fundamental role in making the methods developed in Miskolc known internationally. [1,17]

Summary

The central element of Professor József Farkas’s professional legacy is the development of an engineering approach that treats the analysis and synthesis of load-bearing metal structures, manufacturability requirements, and economic efficiency as parts of a unified design framework. The structural optimization school that emerged at the University of Miskolc from the 1970s onward did not regard simple mass minimization as its ultimate goal. Instead, it sought structural alternatives that were safe, could be designed and verified in accordance with standards, were technologically feasible, and were competitive in terms of total manufacturing cost.

Professor Farkas linked this approach to the study of welding-induced residual stresses and deformations, the analysis of stability phenomena, the design of thin-walled and stiffened structures, and, later, detailed manufacturing cost models. Together with his colleagues, he applied these methods to stiffened plates,

cellular plates, box girders, cylindrical and conical shells, tubular structures, frames, components of cranes and conveying equipment, wind turbine towers, and steel structures designed for fire resistance.

This study evaluates that scientific legacy primarily from a technical and methodological perspective and explains why the Farkas approach may be regarded as a precursor of contemporary computer-aided, multiobjective, and sustainability-oriented structural design.

Keywords: structural optimization; welded structures; residual stress; stability; stiffened plates; cost optimization; manufacturability; steel structures; University of Miskolc.

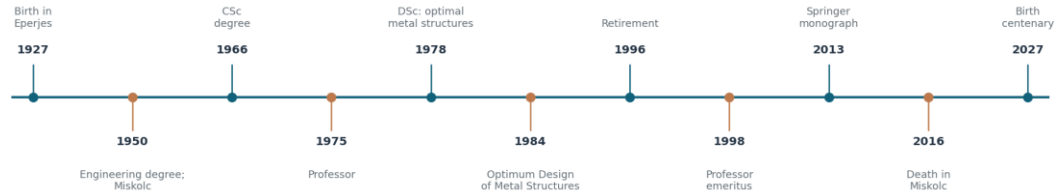


Figure 1. Major milestones in the professional career of József Farkas. Source: compiled by the author [1], [2], [17].

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