



# Introduction

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Is the Fourier transform, which was developed around 1822 by its namesake, Jean Baptiste Joseph Fourier (1768–1830), just a nice mathematical gimmick or does it have any practical meaning?

The second part of this question must be answered with a clear and forceful “yes.”

The Fourier transform is “hidden” in all modern technologies that have something to do with signal transmission and processing, such as mobile telephony, the Internet, digital controllers in vehicles, household appliances, medical equipment, and space travel.

Of course “many roads lead to Rome” and it would be presumptuous to claim that all the applications mentioned in the sequel would not have been invented without the Fourier transform. For some of them, the only thing that applies is that they can be explained particularly clearly by means of the Fourier transform, as we will show with the example of modulation in Chap. 6.

In other applications, such as orthogonal frequency division multiplexing (OFDM), which is used for signal reception for LTE in mobile communications, a modification of the Fourier transformation, the so-called Fast Fourier Transformation, was implemented directly. LTE and thus the fast mobile Internet are simply unthinkable without Fourier transformation.

The digitization of speech and music and thus MP3 and MP4 directly use the insights of the Fourier transformation.

This applies not least to the internet, which does not, as a recent loose contact keenly claimed, get by without electricity, but is dependent on the services of “very physical” wired or radio-based transmission networks, which in turn uses the Fourier transformation.

It is, therefore, worthwhile to engage in this subject.