

Rendering of the term Engineering in the Greek language

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The term **Engineering** expresses in an inclusive way both the intellectual and the practical character of the engineer's activities by comprising the study, as well as the materialization of processes, constructions or works.

In the Greek language the term **Engineering** is rendered sometimes as **Mechanics** and sometimes in a periphrastic way.

However, Mechanics is a specific science that forms no more than one of the scientific bases of the engineer's work.

Thus the use of the term Mechanics leads to a non-permissible amphisemy.

The periphrastic, as well as other, one-word versions of the term under study represent attempts for a **detachment** from the term Mechanics .

Some of these will be examined in the next transparency

The term **Επιστήμη του Μηχανικού** (Science of the Engineer) is the one most frequently used.

However, it has the basic deficiency of being periphrastic. Also, it faces the objection that the engineer's technical activity is not exactly science, or at least not only science.

The one-word term **Τεχνοεπιστήμη (Technoscience)** refers to a complex of Science and Technology with their interactions mutually and with the society ([1],[2]).

Nevertheless, the use of this term has been considered for rendering the term Engineering ([3], [4]), although it cannot be maintained that these two terms can be identical, since Technoscience is a hybrid term that brings forward the fuzzy limits between Science and Technology

Μηχανίκευση (Mechanization) is another term for rendering **Engineering**, that represents the effort for a differentiation from the term **Μηχανική (Mechanics)**. It possesses the advantage of containing the root **μηχαν-**, but, regarding the ending **-ίκευση**, the following lemmas of the Inverse Dictionary are illuminating:

εκλαϊίκευση, λογίκευση, εκλογίκευση, ειδίκευση, εξειδίκευση, καθολίκευση, ατομίκευση, εξατομίκευση, εκκοσμίκευση, ιδανίκευση

All the above words signify conversion, e.g something is not **ατομικό** (individual) and it undergoes **ατομίκευση** (*individualization*), something is not **λογικό** (*rational*) and it undergoes **λογίκευση ή εκλογίκευση** (*rationalization*)

Therefore the term **μηχανίκευση (mechanization)** will analogously signify conversion into **μηχανικό** (mechanical) of a thing or object, which is not **μηχανικό** (mechanical) . This process, however does not represent the engineer's work or activities.

The term *Μηχανοτεχνία (Mechanotechnics)*

The term *Μηχανοτεχνία (Mechanotechnics)* is considered as the most satisfactory one so far, because

- (a) It is not periphrastic
- (b) It shares the same root with the terms μηχανή and Μηχανική
- (c) The second component part of the word refers to practical – technical side of the engineer's work, offering thus a more satisfactory coverage of the engineer's work.

These advantages, as well as a feasibility analysis for the introduction of this term are exposed analytically in an introductory note of the translators of the book by Carl Micham:

Η Τεχνολογική Σκέψη. Το μονοπάτι μεταξύ μηχανοτεχνίας και φιλοσοφίας.

Thinking through Technology. The path between Engineering and Philosophy

However, the problem of rendering the term Engineering was dealt with in an overall manner by Kolaitis (1964), whose work also grants preference to the term

Μηχανοτεχνία (Mechanotechnics)

Immediately below certain objections will be presented against the use of the term ***Μηχανοτεχνία***

According to Kolaitis (1964) the derivational ending **-τεχνία** brings forward the “semantic extent” contained in the term engineering and this is confirmed by the analogy to other words that are characterized by the same ending, such as

«καλλιτεχνία», «δεξιοτεχνία», «λογοτεχνία».

On the other hand, the Inverse Dictionary gives 47 lemmas with the same ending.

A simple inspection reveals that in most cases the ending under consideration marks terms that describe practical or even manual activities, regardless of the fact that these activities may require special dexterities or artistry. Representative examples are:

μεταλλοτεχνία, κρυσταλλοτεχνία, κηποτεχνία, οδοντοτεχνία, λιθοτεχνία, βιβλιοτεχνία and many more

This fact means that it is difficult to detach the term **μηχανοτεχνία** from the more “pedestrian” notion of art or technique of machines as such.

The lemma «**ηλεκτροτεχνία**» is of particular importance. The latter (**Electrotechnics**) is a central subject in the electrical engineer's studies. It can easily be found as a course title in programs of study of Engineering Schools or Schools of Technology.

The term Ηλεκτροτεχνία certainly does not cover the breadth of the English term **electrical engineering** and the characteristic ending **-τεχνία** marks the practical – technical content, analogous to that of most lemmas that have the ending **-τεχνία**.

Therefore, an analogous position should be given to the parallel term **Μηχανοτεχνία**, which must express the art and the techniques related to the construction and the function of machined and nothing more.

Indeed, **Μηχανοτεχνία** existed as a specific subject in older programs of study of Technical Schools, such as Sivitanideios, in parallel with **Ηλεκτροτεχνία** (Αγγελάκης, 2004)

Mechanotechnics (Μηχανοτεχνία) cannot be elevated to the level or to cover the breadth of the term Engineering. This becomes more obvious in cases where both terms appear in the same sentence.

Indeed, if we adopt the term ***Μηχανοτεχνία***, for rendering the term ***Engineering***, then we will have to accept as correct the following sentence:

Electrotechnics is part of Mechanotechnics

which simply cannot hold!

Even today the term **Μηχανοτεχνία (Mechanotechnics)**, with close connection to machines, has by no means ceased to exist, even though somehow indirectly.

DEH, the Public Power Corporation, for example, proclaims positions for

“mechanotechnicians” and “electrotechnicians”

(Government Gazette, sheet no4, ASEP issue, June 3, 2015, p. 115)

Also, a difficulty arises when one attempts to translate (into Greek) the term **mechanical engineering** based on **Μηχανοτεχνία (Mechanotechnics)**

The result will be **μηχανολογική μηχανοτεχνία (mechanological mechanotechnics)**. This however sounds as a tautology!

Even more inelegant and tautological appears the translation of **machine engineering**:

μηχανοτεχνία μηχανών (mechanotechnics of machines) (?)

Also, let it be noted that the Greek term **μηχανοτεχνία** has found a position in the English technical literature as **mechanotechnics**, under the same meaning of the art or of the construction of machines, as encountered in the already mentioned older programs of study of Greek Technical Schools.

Finally, a basic problem consists in finding a unified solution for the translation of

Engineering as an art or science and

of the gerund/noun **engineering**, as an action – activity or practice.

On this issue the term **μηχανοτεχνία** does not offer any help.

What would be the noun and the verb that would correspond to the act of **mechanotechnics**,

and that would, at the same time, belong to the family of words with the root **μηχαν-** ?

Let us note that except Μηχανοτεχνία, it is possible to propose two more cases of words that could render the notion of Engineering.

These are

(1) **Μηχανωτική**

From the verb «**μηχανάομαι - μηχανώμαι**», which according to the Liddell and Scott dictionary means

(α) «κατασκευάζω μετά τέχνης, συναρμώζω, κατασκευάζω, οικοδομώ»,
(*Construct with art, put together, construct, build*)

(β) «επινοώ, τεχνάζομαι».

(*invent, contrive*)

It (Μηχανωτική) is mentioned by Kolaitis (1964)

(2) **Μηχανητική**

From the adjective **μηχανητικός**, which according to the same dictionary, means cunning, inventive (suggested by Emm. K. Zacharenakis)

Cases (1) and (2) do not offer any easy way out from the problem of the unified solution posed in the previous transparency.

The proposed solution

The present article proposes the term **Μηχανευτική**

This term is drawn from the depository of the Greek language in its diachronic (intertemporal) dimension.

The verb **μηχανεύομαι** is again according to the Liddell and Scott dictionary, a synonym to **μηχανώμαι**

Therefore, just as the verb **μηχανώμαι**, it expresses fully the concept of the verb **engineer**.

Also, it is included in the vocabulary of modern Greek.

The derivative noun is

μηχάνευσις

which is interpreted in the Liddell and Scott dictionary as «επιινόησις, επίνοια, παρασκευή» (invention, device, design).

Thus the noun **μηχάνευσις**

points to the intellectual side of the engineer's activities and the noun **μηχάνευση** could very well be adopted by the Modern Greek vocabulary for rendering the gerund/noun **engineering**.

The term **μηχάνευση** has already appeared at least in one modern technical text in the meaning just described.

On page 22 of that text it is mentioned that «**απαγορεύεται η αντίστροφη μηχανευση του λειτουργικού τμήματος κώδικα μηχανής**», obviously translating the term **reverse engineering**.

Another interesting example is to be found in the webpage www.greekarchitects.com

In an article by the architect A. Demetrakopoulos it is mentioned that (the underlining and the translation into English are mine, while the original is in Greek):

“Johansen predicted the creation of the foremost organic building on the basis of nano-technology and on molecular production: By means of a suitable ***engineering of the DNA*** (***μηχάνευση του DNA***) of plant organisms a plant seed is generated, designed to develop proving spaces suitable for human living”

However, the most characteristic example is contained in the translation of the following excerpt from the book of Micham (p. 206 in the original), with underlining of this writer:

“Smart artifacts depend not just on cybernetic feedback loops but on expert systems and what is called knowledge engineering. But can knowledge be engineered?”

This excerpt is translated as follows in the Greek edition of the book (p.277):

«Τα «έξυπνα» τεχνήματα δεν εξαρτώνται μόνο από κυβερνητικούς βρόχους ανάδρασης αλλά και από έμπειρα συστήματα και ό,τι αποκαλείται συνήθως μηχανοτεχνία της γνώσης. Αλλά μπορεί άραγε η γνώση να τύχει εκμηχάνευσης;»

Remark: The term μηχανοτεχνία is abandoned in the last sentence in favor of (εκ)μηχάνευση

According to Kolaitis (1964) the term **μηχανευτική** does not cover the whole breadth of meaning carried by the term **engineering**. Similar views are presented in the introductory note of the translators of Micham's book.

The present work maintains the opposite view.

In a previous transparency the immediate connection of **Μηχανοτεχνία** (***Mechanotechnics***) to machines was stressed;

also, the hasted transition of the term to one further level of abstraction or metaphor, so as to cover the breadth of ***engineering***.

On the other hand, the term **μηχάνευση** contains the abstract element at the outset.

In order to understand this view we may again utilize the tool of the Inverse Dictionary in the next transparency

From the lemmas bearing the ending **-νευση** we glean the following:

πρυτάνευση, σαγήνευση, ερμήνευση, ειρήνευση, ρητίνευση, ανίχνευση, συγχώνευση

These examples express actions, each one of which involves a process.

Obviously, **μηχάνευση** belongs to this category.

The derivative **Μηχανευτική** naturally expresses the systematic exercise or practice of **μηχάνευση** and therefore also the branch of the science or art of the engineer.

The abstract element exists in the words **μηχάνευση** and **Μηχανευτική** and there is no need for a transition from literality to metaphor, as it happens with the word **Μηχανοτεχνία**, so that the latter will cover the concept of Engineering.

Therefore, a unified solution is presented for rendering the term ***Engineering***.

The couple ***μηχάνευση – Μηχανευτική*** not only covers conceptually the term ***engineering***,

but it also introduces the distinction between

the action and

the practice or art or science of the engineer,

which is not accomplished by the word *engineering* that leaves this distinction to the context.

The main objection to the introduction of

Μηχανευτική

as a name for a technical – scientific field is based on the fact that the verb

μηχανεύομαι

both in its ancient Greek but even more in its modern Greek version is loaded with the negative content of guile.

The verb ***μηχανεύομαι*** in contemporary every day speech is a synonym of ***δολοπλοκώ ή βυσσοδομώ (plot or scheme)*** and, therefore, the term ***Μηχανευτική*** may give rise to associations beyond the bounds of the objective character of a scientific field.

This objection can be overcome, if it will be taken into consideration that among engineers the conviction is prevalent that the field of their activity is of different constitution from that of the scientist.

The engineer thinks that he/she is using a different methodology from that of the classical scientist

The engineer attempts to intervene into the environment by using

Heuristic methods

Approximate simulation models and

Data that are on many occasions fuzzy and not always numerical

In other words, the engineer thinks that he/she manages things, even with indirect methods.

This may be considered to constitute some kind of generalized guile, with the difficulty of the problem as the opponent.

This is the spirit of the view promoted by Prokopakis, who also proposes the term **μηχανευτής**, in order to characterize the engineer, with a somewhat admittedly poetic tone.

It turns out, therefore, that the engineer's work is not free from doses of indirect approaches and that

associations of guile or maneuvering are not strange to the notion of **Μηχανευτική**, just as they are not strange to the notion of **Engineering**

Let us again use the tool of an Inverse Dictionary (www.wordlink.com).

Examples of verbs with the ending –eer:

domineer, fictioneer, buccaneer, electioneer, profiteer, racketeer.

These verbs have negative connotations

However, this represents a more general trend, according to the History of the English Language (Cambridge, vol.3, p. 393) and according to the book *Making new words. Morphological derivation in English* , p. 312.

Evidently, the derivational ending **-eer** attaches to the verb **engineer** and to the gerund **engineering**

at least a slight deviant dimension, without, nevertheless, adding any kind of disrepute to these terms.

This ending simply renders a realistic mixture of the activities and the mentality of the engineer, as an agent capable of finding means and methods for the solution of real-world problems.

Exactly the same is true of the proposed terms **μηχάνευση** and **Μηχανευτική**

These terms do for the present register any strong presence in the every day modern Greek vocabulary and, therefore have not but indirectly and minutely been “infected” with negative connotations.

On the other hand, if they are introduced into the body of the scientific – technical terminology and into the educational system, then their full content will be established, in which case even their introduction into the every day vocabulary will materialize under better conditions.

The final proposal of the present article for rendering the term Engineering is summarized as follows:

μηχανευση: Complex action of design and materialization of processes, constructions or works.

μηχανευτική: The systematic exercise or practice of **μηχάνευση**.

Μηχανευτική: The science and art of **μηχάνευση**.

Regarding the verb **engineer**, the immediate choice for its translation is the verb

Μηχανεύομαι,

which, however, in its modern Greek version is heavily loaded with the notion of “cunning” or guile and it does not cover the requirements for the description of a scientific or technical activity.

The active voice form **μηχανεύω**

could accomplish that mission.

Certainly, the verb **μηχανεύω** will not be found in dictionaries of Modern Greek. The same is true of **μηχάνευση** and **Μηχανοτεχνία**.

Nevertheless, this verb has already made its appearance, at least within the poetic sphere:

*Γρίφους και αινίγματα / μηχανεύω διαρκώς / διασκεδάζοντας
την πλήξη / που νομίζω πως θα λήξει
(Stavrosstavrides.blogspot.gr)*

The verb *engineer* plays a decisive role in the title of the book of Henri Petroski, Professor in the Civil Engineering Department of Duke University, USA

The title is “**To Engineer is Human**”

It constitutes a word playing paraphrase of the saying
“**To Err is Human**”.

The subtitle of the book is «**The Role of Failure in Successful Design**»

and the spirit of the book consists in relating failures or mistakes to the progress in Engineering

For the above English saying there is a verbatim Greek proverbial phrase:

«***Το σφάλλειν ανθρώπινον***».

But how will Petroski’ s paraphrase be translated?

The active voice verb μηχανεύω will have to be recalled from its ancient of medieval hibernation:

«***Το μηχανεύειν ανθρώπινον***».

Examples from various areas of Engineering

Mechanical Engineering: *Μηχανολογική Μηχανευτική*, preferable to the tautological *Μηχανολογική Μηχανοτεχνία*, as explained in a previous transparency.

Machine Engineering: *Μηχανευτική Μηχανών* and not *Μηχανοτεχνία Μηχανών*.

Agricultural Engineering: *Γεωργική Μηχανευτική* and not *Γεωργική Μηχανική*, as it tends to be established, nor *Γεωργική Μηχανοτεχνία*, because there is a danger of confusion with the established term *Γεωργική Μηχανολογία*.

Geotechnical Engineering: *Γεωτεχνική Μηχανευτική* and not *Γεωτεχνική Μηχανική*

Earthquake Engineering: *Αντισεισμική Μηχανευτική* and not *Σεισμική Μηχανική*, which corresponds verbatim to the term *Earthquake Mechanics*, that refers to Geophysics departments and not to Engineering Faculties.

Civil Engineering: Πολιτική Μηχανευτική

Chemical Engineering: Χημική Μηχανευτική and not **Χημική Μηχανική**, nor **Χημική Μηχανοτεχνία**.

Hydraulic Engineering: Υδραυλική Μηχανευτική and not **Υδραυλική Μηχανική**, nor **Υδραυλική Μηχανοτεχνία**, in which case there is the danger of confusion with the specific subject of Hydraulic Machines.

Genetic Engineering: Γενετική Μηχανευτική and not **Γενετική Μηχανική**, as it tends to be established.

Bioengineering: Εμβιομηχανευτική and not **Εμβιομηχανική**, which is a translation of **Biomechanics**.

Social Engineering: Κοινωνική Μηχανευτική and not **Κοινωνική Μηχανική**. A characteristic example is given in the book by F. Doudar with the subtitle «*Η Μηχανική των Εθνότητων ...*», “*The Mechanics of Nations ...*”, as it appears in the Greek translation. Obviously here the term **Μηχανευτική** is more appropriate.

Financial Engineering: Χρηματοοικονομική Μηχανευτική and not **Χρηματοοικονομική Μηχανική**.

Epilogue

It can be concluded that the Greek Language is capable of providing a unified solution to the problem of rendering the term *Engineering*,

offering words sharing the same root

for the science or art of the engineer

for the systematic practice and

for the action that this term (engineering) expresses;

also, for the corresponding verb.

This common root is the same with the one contained in the term Μηχανική (Mechanics), so that affinity in sound will reflect affinity in meaning.

This advantage is not possessed by the English language, nor by the other main central European languages.

We may, therefore, propose for these languages alternative hellenogenic terms, that will serve that purpose.

For the English language the alternative proposal for Engineering would be

Mechaneutics ή Mechanautics.

The French language uses the term ***génie (génie civil, génie chimique).***

The proposal would be

mécaneutique ή mécanautique.

The German terminology contains the term ***Ingenieurwesen.***
The proposal is

Mechanautik ή Mechaneutik.

In all these terms both the affinity and the differentiation from the Mother Science Mechanics are evident.

Finally, there is the question of whether the word **μηχανικός** (engineer) can be replaced so that a rectification will be achieved with the term **Μηχανευτική**.

The answer is that this is for the present infeasible, given that the word **μηχανικός** is deeply rooted both in the scientific community and in the wider public.

The correct name would be **μηχανευτικός** for reasons of grammatical consistency (Μαθηματικά – μαθηματικός, Φυσική – φυσικός and so on).

If the term **Μηχανευτική** is ever adopted and established, then there is a possibility for the term **μηχανευτικός** to be adopted in the long run.

THANK YOU FOR YOUR ATTENTION!