Training Specialists for Developing Digital Power Equipment

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The Origins Of The Industry

Four industrial revolutions
from industry 1.0 to industry 4.0

Industry 1.0: mechanization; replacing muscle strength with steam energy
1784 r.

Industry 2.0: electrification; introduction of conveyor production
1870 r.

Industry 3.0: automation; introducing the introduction of robotic systems with CNC
1969 r.

Industry 4.0: smart manufacturing

The first industrial revolution (end XVIII-beginning XIX of the century) - the transition from an agricultural economy to industrial production

The first industrial revolution (end XIX - beginning XX of the century) - the use of electrical energy

Third industrial revolution (since 1970) - automation of production

The Fourth Industrial Revolution (today) - the advent of fully digital products
Digital Transformation in Industry 4.0
In order to exploit the full potential of Industry 4.0, especially in the field of development of modern power equipment, changes in the labour market are necessary in accordance with changing requirements and, as a result, in concepts of training, as people are the key factor of success.

Almost all components of Industry 4.0 rely on digital equipment or digital technologies - which, in turn, requires, first of all, training of specialised developers.

None of the technologies of Industry 4.0 will be able to work without electricity - making energy a key element of the new technological order - which is, in its turn, based on new activity principles.
**Requirements to the Competence of Developers of High-Tech Power Equipment**

- Technical and technological skills of working with modern digital technologies, platforms, software, ability for diverse and efficient online communication, use of Big Data technologies;

- Intellectual - using skills of flexible and critical thinking;

- Activity - mastering the abilities of multitasking and creative work, including in international groups

**Methodological Approaches for Practice-Oriented Training**

The traditional way of training becomes unsuitable when the future specialist is trained for the professional solution of typical problems. At the same time, in order to successfully learn the discipline, students need to learn general knowledge and typical actions and reproduce them at the right moment - which actually turns learning into a mainly passive process with the only proactive actor - the teacher.

Therefore, it is necessary to move from traditional mode of education to creative and innovative, which is based on the technology of knowledge acquisition, rather than their content, which, in the context of digital realities of Industry 4.0, is rapidly becoming obsolete and needs to be continuously updated.
Set Of Training Methods When Using Activation Technology

The teacher’s formulation of the problem, the objectives of its solution, the main directions and approaches to the solution (at the lecture)

Providing the student with a detailed set of materials on the problem during lectures

Self-study of the problem by students, its analysis and evaluation of alternatives to the solution

Joint discussion, projecting the ways of solving the problem. Control and evaluation of knowledge level, systemic and creative approach to solution

Execution of tasks, projects in the form of solving specific practical problems. Assessment of the student's readiness for practical solution of problem situations

Final control of subject retention

Readiness of the student for a certain type of activity in non-standard problem situations and for the independent search of the necessary knowledge for this purpose
Direction 2. Generation of electrical energy. Nuclear power.
Direction 3. Electric power generation. RES (wind, hydro, petrothermal and solar generation).
Direction 5. Transmission of electrical energy (electrical networks and cables).
Direction 6. Final energy consumption.
Direction 8. Digitalization of the electric power industry.
Direction 9. Technology Industry 4.0
Organizational Structure of Future Technologies

Moscow, Russia
14-17 April, 2020

Program Manager
Deputy Head
Block 1 Manager

Direction managers
breakthrough project managers

graduate qualification managers
graduate qualification consultants work

Masters and Bachelors

The list of tasks to be solved by a group of topics

- Task development 1
- Task development 2
- Task development 3
- Task development 4
- Task development 5
- Task development 6

Departments in the direction of development

1-2 masters
1-2 masters
1-2 masters
1-2 masters
1-2 masters
1-2 masters
## Point Rating System

### Moscow, Russia
14-17 April, 2020

### Table: Control Points

<table>
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<tr>
<th>№</th>
<th>Index</th>
<th>Title</th>
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<td>CE 7</td>
<td>Development of a project passport for the organization of production</td>
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Software Application In The Process Of Specialists Training In The Development Of Digital Power Equipment
The Need to Follow Industry 4.0

Global market in Internet of Things technology

- $1.7 trillion 2019
- +20% Annual growth in Industry 4.0 investments worldwide. Stock of industrial robots grows by 15% p.a.
- $300 billion Investments by manufacturing companies in digitalization projects by 2020

Connected devices worldwide

- 4 out of 5 Executives say Industry 4.0 is the most important tech development of the decade
- Smart factories are expected to create a sevenfold increase in overall productivity by 2022. Source: Capgemini Smart factories: How can manufacturers realize the potential of digital industrial revolution.

- 71% Companies already using some Industry 4.0 technology in 2018
CONCLUSION

- Industry and, in particular, power equipment, becoming more "intellectual", caused by the development of technologies of the fourth industrial revolution (Industry 4.0) sets new requirements to the training of specialists - developers of digital equipment.
- This requires a wide introduction of modern software packages into the educational process for students, which will be used by them in the future in the framework of their professional activities.
- The experience of the National Research University "MPEI" in organizing the work of master's students within the framework of real projects of the Research Program "Energy", reviewed in this report, makes it possible to recommend its application to other educational institutions.
Thank you for attention!

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