

## Chemistry in curriculum for future engineers in food machinery

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Republic of Belarus has a developed rural economy. Food is an important export item in national economic. The share of Brest region to the total export of agricultural products of Belarus in 2017 was 25 %. For this reason since 2011 a new speciality “Food Machinery” has been opened at Brest State Technical University (BrSTU). As the modern food industry uses a wide range of chemical methods in the production, processing, storage and analysis of food products the chemistry should be incorporated to the curriculum for future engineers.

The students study the basis of General chemistry in the first year. As the main element of this academic discipline there are three *content lines* [1]. These lines form the template of classical General chemistry course:

- substance: composition, structure and properties,
- chemical process: energetics, rate and equilibrium,
- chemical methods of identification and quantification of substances.

Three additional content lines were offered to adjust the chemical education to the students’ needs:

- chemistry and engineering as an area of future professional activity,
- chemistry and environment protection,
- chemistry and every-day life.

The course includes 50 h of lectures, 34 h of laboratory classes and 18 h of seminars and corresponds to 6 credits.

Main outcomes which we expect from the General chemistry course is not only to form basic academic competences but prepare students for series of special disciplines at second, third and fourth years such as material science and food technology. Content lines allow us to create strong and flexible interdisciplinary connections between General chemistry and other units inside curriculum.

The third year students start studying new academic discipline “Technology of Food Production”. It is designed for three semesters (13.5 credits). The course includes laboratory classes (64 h). For this purpose training laboratory was equipped at the BrSTU (Fig.). The list of laboratory works comprises the determination of chemical and organoleptic properties of milk, dairy and fermented milk products, fruits and vegetables, yeast, bread, grain, flour, pasta, meat and meat products, sausage, fish, table salt, starch, baby food, tea, honey, sugar and seasonings; determination of water quality for the needs of food

industry. All these investigations require basic knowledge of analytical chemistry and laboratory work skills from the students (titration, preparation of solutions, weighing etc).

However it is not enough for a qualified engineer to know only the classical method of chemical analysis. Modern precision instrumental analytical methods are used in a wide scale in a food industry. Of course detailed consideration of these ones is impossible due to the lack of time and the complex nature of the teaching material. But familiarization of students with modern analytical chemistry application can be achieved in a review lecture. This idea was realized at the BrSTU in collaboration with colleagues from the University of Cordoba (Faculty of Science). The lecture of the following content was delivered for fourth year students:

- EU regulations and guidelines about food additives, residues and contaminants;
- high-performance liquid chromatography;
- ultra-high performance liquid chromatography;
- strategies to improve the analytical features in food analysis (derivatization and use of pre-concentration techniques;
- role of nanomaterials such as sorbents;
- selected applications for food analysis.

This lecture pulled students' interest, because it showed state-of-the-art chemical science and its application in food industry.



Fig. Training laboratory for academic discipline  
“Technology of Food Production”

Undoubtedly the formation of a continuous chemical education system within the curriculum allows us to prepare high-qualified engineers capable to implement applied tasks.

### References

1. V. Khaletski. Baltic STE 2015: State-of-the-Art and Future Perspectives: (2015) : 59.