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| 1. Subject name | **Traction mechanics** | | | | |
| 2. Subject name in Hungarian | Vonattovábbítás mechanikája | | | | |
| 3. Code | **BMEKOVRM619** | 4. Evaluation type | **exam grade** | 5. Credits | **3** |
| 6. Weekly contact hours | **2 (9) Lecture** | **1 (5) Practice** | **0 (0) Lab** | | |
| 7. Curriculum | **Vehicle Engineering MSc (J)** | 8. Role | **Specialization (sp) at Vehicle Engineering MSc (J)** | | |
| 9. Working hours for fulfilling the requirements of the subject | | | | | **90** |
| Contact hours | 42 | Preparation for seminars | 8 | Homework | 0 |
| Reading written materials | 13 | Midterm preparation | 12 | Exam preparation | 15 |
| 10. Department | **Department of Aeronautics and Naval Architectures** | | | | |
| 11. Responsible lecturer | Dr. Zobory István | | | | |
| 12. Lecturers | Dr. Zobory István | | | | |
| 13. Prerequisites | | | | | |

## 14. Description of lectures

Movement factors of the train: the traction force, the brake force, the track-force. The control of the traction and brake effort by the control of the torsion affairs of the rotational system. Determination of the train mass which can be start-moved by traction unit; the construction of the Koreff-diagram. Determination of the velocity-time diagram by dynamical model based simulation. Consideration of the limit-force which can be transferred in the rolling contact. The train as a longitudinal swingsystem. The dynamic of the train-tear. The dynamic of the special train movements: the shunting, the sorting, the sorting hump. Energy requirement to move the train, the simulation of the energy consumption in cases of the diesel and electric traction. Outlook on the question of the energy-optimal train-control, the principle of the determination of the optimal tractive and brake effort, the numerical implementation of the latter.

## 15. Description of practices

Processing of the numerical data and characteristic curves of the vehicles and tracks. Integration methods of the train motion equation in MATLAB environment. Computation of the energy consumption of the train motion realized by the diesel and electric vehicles. Numerical processing and graphical representation of the characteristic surfaces of the longitudinal structure connections. Numerical realization of the optimal train movement in MATLAB environment. Determination and analyzation of the movement diagrams of the special train movements. Determining data for construction of the schedule.

## 16. Description of labortory practices

## 17. Learning outcomes

A. Knowledge

- Understands and applies the mathematical and scientific principles and procedures of the train traction mechanics.
- Understands and can apply in a wide circle the theories and terminologies elaborated for professional area of train forwarding.
- Knows and understands the basic facts, limits and development possibilities of the train forwarding.
- Knows and understands the traffic, logistic, environment-, work- and fire protection viewpoints of the train forwarding.
- Knows and understands the information and communication technology which are connected with the train forwarding.
- Knows and understands the methods of the computer modelling and simulation which are connected with the train forwarding.

B. Skills

- Able to apply in innovative way the required mathematical and scientific principles and procedures for solving the problems connected with the train forwarding.
- Able to apply, to analyze and to evaluate the methods applied in the field of the train forwarding.
- Shows ability to apply integrated knowledges in the field of the train forwarding.

C. Attitudes

- Open and receptive to know and to pass on the developments and innovations which are taken place on the field of the train forwarding. The sense of vocation is depth.
- Accepts the professional and ethical values-system connected with the professional area of the railway.
- Pursuing to use complex and on system-oriented mentality based approach to the processes.
- Pro-activity in professional work, the self-standing selection and application of the solution methods.
- Making decision circumspectly and responsibility.

D. Autonomy and Responsibility

- Takes into account in the decisions the regulations of the environment, the law and the engineering ethics.

## 18. Requirements, way to determine a grade (obtain a signature)

During the semester there is necessary the individual solving of some tasks (ability, attitude, responsibility). The criterion of signature is both the active participation at the class (attitude), and the complete solving of the semester's tasks (knowledge, ability, autonomy). During the semester there is necessary to successfully write two midterm tests (knowledge, ability, autonomy). In the fields of attitudes and autonomy the results achieved in the semesters are included in the final classification by weight 50%. At the end of semester there is an examination (knowledge, ability, attitude).

## 19. Opportunity for repeat/retake and delayed completion

Possibility to refit the control works and the homeworks, to repeat the examination, properly to the Study and Exam Regulations.

## 20. Learning materials

Kopasz Károly: A vonattovábbítás mechanikája.
Wende, D.: Fahrdynamik. Verlag für Verkehrswesen. Berlin, 200-

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| **Effective date** | 10 October 2019 | **This Subject Datasheet is valid for** | Inactive courses |