

**SUBJECT DATA SHEET AND REQUIREMENTS**last modified: 29<sup>th</sup> of August 2015**FLUID MECHANICS****ÁRAMLÁSTAN**

| 1 | Code               | Semester Nr.<br>or fall/spring | Contact<br>hours/week<br>(lect.+semin.+lab.) | Requirements<br>p / e / s | Credit   | Language       |
|---|--------------------|--------------------------------|--|---------------------------|----------|----------------|
|   | <b>BMEGEÁTAG11</b> | <b>5. (fall)</b>               | <b>2+2+1</b>                                 | <b>p</b>                  | <b>5</b> | <b>English</b> |

**2. Subject's responsible:**

|               |                |                           |
|---------------|----------------|---------------------------|
| Name:         | Title:         | Affiliation (Department): |
| Dr. János VAD | full professor | Dept. of Fluid Mechanics  |

**3. Lecturer:**

|                   |                     |                           |
|-------------------|---------------------|---------------------------|
| Name:             | Title:              | Affiliation (Department): |
| Dr. Csaba HORVÁTH | assistant professor | Dept. of Fluid Mechanics  |

**4. Thematic background of the subject:** mathematics, solid mechanics, basic knowledge in physics**5. Compulsory / suggested prerequisites:**

Compulsory: Strength of Materials /BMEGEMMAGM2/ AND (Mathematics A3 /BMETE90AX10/ OR Mathematics A3 complex /BMETE90AX23/ )

**6. Main aims and objectives, learning outcomes of the subject:**

Students will acquire the knowledge necessary to understand and describe the flow of gaseous and liquid fluids, which is important from a technical point of view. Building on this knowledge, the laboratory sessions and seminars will show the students how to solve technical problems related to the flow of a medium. An emphasis will be placed on knowledge related to flow measurements, measurement techniques applied in evaluating flow phenomena occurring in fluid machinery, equipment, and ducts. The students will be evaluated on their ability to learn the theory and apply it to practical problems. These evaluations will be in the form of mid-term exams, tests, and laboratory measurements. This subject prepares the students for their engineering careers by teaching them to recognize fluid mechanics related problems, provides them with the knowledge necessary to solve common problems, and gives them a solid foundation on which they can build in taking on complex assignments.

**7. Method of education:** lecture 2h/w, seminar 2h/w, laboratory 1h/w**8. Detailed thematic description of the subject:**

|        |                               |   |
|--------|-------------------------------|---|
| 1 week | 1.LECT:<br>1.SEMIN:<br>1.LAB: | Properties of Fluids, Newton's law of viscosity, Description of fluid flow<br>Problem solving according to the topics covered during the lecture<br>+ week course: 1 <sup>st</sup> preparatory class: introduction of measurement techniques and instruments  |
| 2 week | 2.LECT:<br>2.SEMIN:<br>1.LAB: | Force fields, Gas, Steam and Liquid Mediums, Cavitation, Hydrostatics, Static Draft in a Chimney, Atmospheric models.<br>Problem solving according to the topics covered during the lecture<br># week course: 1 <sup>st</sup> preparatory class: introduction of measurement techniques and instruments                               |
| 3 week | 3.LECT:<br>3.SEMIN:<br>2.LAB: | Kinematics, Continuity, Local and Convective Change, Dynamics, Fluid Acceleration, Euler Equation, Bernoulli-Equation<br>Problem solving according to the topics covered during the lecture<br>+ week course: 2 <sup>nd</sup> preparatory class: introduction of measurement techniques and instruments                               |
| 4 week | 4.LECT:<br>4.SEMIN:<br>2.LAB: | Static, Dynamic, and Total Pressure, Euler-Equation in the Natural Coordinate System, Potential Flow, Irrotational Vortex, Measurement of Pressure.<br>Problem solving according to the topics covered during the lecture<br># week course: 2 <sup>nd</sup> preparatory class: introduction of measurement techniques and instruments |



|  |                                 |  |
|--|---------------------------------|--|
| 5 week   | 5.LECT:<br>5.SEMIN:<br>3.LAB:   | Measurement of Volume Flow Rate (Based on flow Contraction, Based on Velocity Measurement), Thomson Theorem.<br><b>1<sup>st</sup> mid-term exam (on the material covered prior to the mid-term).</b><br>+ week course: 3 <sup>rd</sup> preparatory class: + <b>week measurement mid-term exam</b> , introduction of the measurement rigs and measurement tasks   |
| 6 week   | 6.LECT:<br>6.SEMIN:<br>3.LAB:   | Helmholtz I. and II. Theorems, Integral Momentum Theorem, Sample Problems.<br>Problem solving according to the topics covered during the lecture<br># week course: 3 <sup>rd</sup> preparatory class: # <b>week measurement mid-term exam</b> , introduction of the measurement rigs and measurement tasks<br>RETAKE IN A NOT REGULARLY SCHEDULED CLASS PERIOD: + <b>week measurement mid-term exam retake, and oral retake</b>  |
| 7 week   | 7.LECT:<br>7.SEMIN:<br>4.LAB:   | Borda Mouthpiece, Contraction, Borda-Carnot Loss, Pelton turbine<br>Problem solving according to the topics covered during the lecture<br>+ week course: "+A" measurement<br>RETAKE IN A NOT REGULARLY SCHEDULED CLASS PERIOD: # <b>week retake measurement mid-term exam and oral retake</b>  |
| 8 week   | 8.LECT:<br>8.SEMIN:<br>4.LAB:   | Deflection of a Jet Using a Blade, Sudden Closing of a Pipe, Allievi Theorem, Moment of Momentum Equation, Euler's Turbine Equation.<br>Problem solving according to the topics covered during the lecture<br># week course: "#A" measurement  |
| 9 week   | 9.LECT:<br>9.SEMIN:<br>5.LAB:   | Rheological Curves, Equation of Motion of a Viscous Fluid, Reynolds Experiment, Laminar and Turbulent Flow, Hydraulics (+B.E.), Pipe Friction (In General)<br><b>2<sup>nd</sup> mid-term exam (on the material covered prior to the mid-term).</b><br>+ week course: "+B" measurement, submission of "+A" measurement report   |
| 10 week  | 10.LECT:<br>10.SEMIN:<br>5.LAB: | Laminar Pipe Flow, Turbulent Pipe flow, Rough Pipes, Non-Circular pipe Cross-Section, Free Surface Flow, Boundary Layer<br>Problem solving according to the topics covered during the lecture<br># week course: "#B" measurement, submission of "#A" measurement report<br>RETAKE IN A NOT REGULARLY SCHEDULED CLASS PERIOD: <b>1<sup>st</sup> and 2<sup>nd</sup> retake mid-term exams</b>  |
| 11 week  | 11.LECT:<br>11.SEMIN:<br>6.LAB: | Boundary Layer Properties, Hydraulic Losses of Pipe Elements.<br>Problem solving according to the topics covered during the lecture<br>+ week course: submission of "+B" measurement report, makeup and supplementary measurements, consultation regarding the post-processing and presentation of laboratory measurements   |
| 12 week  | 12.LECT:<br>12.SEMIN:<br>6.LAB: | Gas Dynamics, Energy Equation, Speed of Sound, Flow Out of a Simple Tank, Laval Nozzle.<br>Problem solving according to the topics covered during the lecture<br># week course: submission of "#B" measurement report, makeup and supplementary measurements, consultation regarding the post-processing and presentation of laboratory measurements   |
| 13 week  | 13.LECT:<br>13.SEMIN:<br>7.LAB: | Wave Propagation, Similarity of flows for Constant and Changing Density, Forces Acting on Bodies Placed in Flow, Blunt (ex. Cylinder) and Streamlined (ex. Wing) Bodies.<br><b>3<sup>rd</sup> mid-term exam (on the material covered prior to the mid-term).</b><br>+ week course: Presentation of the "+A" and "+B" measurements  |
| 14 week  | 14.LECT:<br>14.SEMIN:<br>7.LAB: | Fluid Mechanics: Summary of the material covered during the semester, with special regard to the engineering practice, through industrial applications. Opportunities to further study fluid mechanics, for those who wish to pursue this topic to a higher level.<br>Select chapters of fluid mechanics, with examples.<br># week course: Presentation of the "#A" and "#B" measurements<br>RETAKE IN A NOT REGULARLY SCHEDULED CLASS PERIOD: <b>3<sup>rd</sup> retake mid-term exams</b> |
| <b>RETAKE EXAM PERIOD:</b> missed presentations can be presented (if the documentation of the measurement was submitted prior to 4 p.m. of the last day of the regular semester, and accepted (min.40%)), and, in accordance with TVSz 16§(3), <b>one unsuccessful mid-term exam</b> can be retaken. |                                 |  |

## 9. Requirements and grading

**9.1. Participation:** Participation in the lectures, seminars, and laboratory measurements, submission of mid-term exams is compulsory. Participation will be verified by signing the mid-term exams, or attendance sheets which will be circulated at lectures and laboratory measurements. Absence without leave is not acceptable, and laboratory measurements which are missed cannot be made up. Any additional questions regarding participation should be dealt with according to the current TVSz.

### 9.2. Mid-semester evaluation:

**9.2.1. Measurement Mid-term exam:** Prior to beginning the laboratory measurements (5<sup>th</sup> or 6<sup>th</sup> week) one measurement mid-term exam will be taken. A prerequisite for receiving a grade for the semester is receiving a "passing" (min. 50%) mark on the measurement mid-term exam, which is also a prerequisite for participation in the measurements.

**9.2.2. Mid-term exams:** During the seminars on the 5<sup>th</sup>, 9<sup>th</sup>, and 13<sup>th</sup> weeks of the semester, three mid-term exams will be taken. The mid-term will consist of the following: a) Write ups on theorems (THE) regarding the applied theory according to a predefined structure, b) Problem solving exercises (EXE), which consist of a written exam reviewing one's ability to solve problems based on the theory and techniques learned during the problem solving exercises. A mid-term exam can only be deemed "passing" if a grade of at least 40% is reached on both the THE and EXE of the same mid-term exam. In order to receive a grade for the semester, one must receive a "passing" grade on all three mid-term exams. The sum of the three mid-term exams, according to the maximum number of points which can be received during the semester, make up 70% of the final grade. Broken down even further, THE makes up 30%, and EXE makes up 40% of the final grade.

**9.2.3. Laboratory measurements (measurement mid-term, laboratory report and presentation):** Measurement groups of 4 students will participate in laboratory measurements to be held in the laboratory of the Department of Fluid Mechanics. Prior to participating in the measurements, the students will participate in 3 preparatory classes to be held on the 1<sup>st</sup>, 3<sup>rd</sup>, and 5<sup>th</sup>, or 2<sup>nd</sup>, 4<sup>th</sup>, and 6<sup>th</sup> weeks of the semester, depending on whether the course is scheduled for +(odd), or # (even) weeks. A prerequisite for participating in the laboratory measurements is the attainment of a passing grade (minimum of 50%) on the measurement mid-term exam, which evaluates the student's knowledge regarding fluid mechanics measurements. The measurement mid-term exam is to be taken during the laboratory preparatory class held on the 5<sup>th</sup> or 6<sup>th</sup> week of the semester, depending on whether the course is scheduled for the + or # weeks. If a student does not pass the measurement mid-term exam (minimum of 50%), then there is an opportunity to take a retake measurement mid-term exam on the week following the measurement mid-term exam, in a predefined time period which is other than the regularly scheduled class period. If this is not passed (minimum of 50%), then there is one opportunity to take an oral retake measurement mid-term exam, after payment of an additional charge. It is possible to take the oral retake measurement mid-term exam until 4 p.m. of the day preceding the students "A" measurement. The score attained on the measurement mid-term exam does not directly count toward ones mid-semester grade, though needs to be passed in order to pass the class, since a passing grade must be attained in order to participate in the laboratory measurements.



Upon completion of the laboratory measurements, a measurement report (maximum 20 points) must be submitted and a measurement presentation (maximum 20 points) must be held, which are worth a total of 40 points. In order to receive a mid-semester grade a minimum of 40% (8 points) must be reached on the measurement report and a minimum of 40% (8 points) must be reached on the measurement presentation. From the measurements a total of 40 points, counting toward 30% of the mid-semester grade, can be reached. A description of the laboratory measurements and the grading system relating to the laboratory portion of the subject are given in a supplementary section of this “*Subject Data Sheet and Class Requirements*” entitled “*Requirements of the fluid mechanics laboratory measurements*”.

**9.3. Grade improvement and retake opportunities:**

**9.3.1. Mid-term exams and tests:** Opportunities are given for retaking each mid-term exam and test, which can be taken in order to improve a failing (<40%) or passing mark, under the same conditions. Retakes are scheduled for time periods which are not a part of the regularly scheduled class schedule. These time periods can be found in section 8 of this document. TVSz 14.§(1) and 16.§(3) are applicable to retake mid-term exams and retake tests: in order to receive a mid-semester grade, a student cannot take retakes for half (rounded down) of the tests and midterms, which in this case amounts to 1 mid-term exam. In accordance with TVSz16.§(3.) – after payment of an additional charge – a maximum of one failed mid-term exam can be repeated during the repeat exam period. In accordance with TVSz16.§(1.), if a mid-term exam or test is repeated with the intent of improving ones grade, then the grade attained on the retake replaces the one previously attained. As given in the TVSz, in the instance of an excused absence (e.g. due to an illness), makeup mid-term exams shall be taken within the shortest amount of time possible, during the regular semester and preferably prior to the scheduled repeat, or prior to the end of the repeat exam period, as agreed upon with the faculty member leading the seminars of the student.

**9.3.2. Laboratory measurements:** Being that participation in the laboratory measurements requires that the measurement mid-term exam be passed, if the measurement mid-term exam is failed (<50%), then a mandatory retake measurement mid-term exam must be attempted on the week following the measurement mid-term exam, in a prescheduled time period, which is other than the regularly scheduled class period. If the repeat measurement mid-term exam is failed (<50%), then the student has one opportunity to pass an oral retake measurement mid-term exam (>50%) in a time period which is other than the regularly scheduled class period, after payment of an additional charge. It is possible to take the oral retake measurement mid-term exam with the faculty member leading the student’s seminars until 4 p.m. of the last workday of the week preceding the students “A” measurement (week 6 for + courses; week 7 for # courses). In the circumstance of an excused absence, the makeup shall be kept in a time period and in a manner agreed upon with the faculty member leading the measurements. In the circumstance of an unexcused absence, no makeup opportunity shall be provided. Laboratory reports cannot be submitted during the repeat exam period. Therefore, any student who does not have a submitted and accepted laboratory report (minimum grade of 40%) by 4 p.m. of the last day of the regular semester fails the course. Students who do not have an accepted (minimum grade of 40%) laboratory presentation fail the course. Repeat presentations can be attempted during the repeat exam period, if the student’s laboratory report is accepted (minimum of 40%) and an additional charge has been paid. Further details can be found in the “*Requirements of the fluid mechanics laboratory measurements*”

**9.4. Requirements for attaining and mode of calculation of the mid-semester grade**

**9.4.1. Requirements for attaining a mid-semester grade**

- Passing grade (minimum of 40%) attained individually on all of the THE and EXE sections of each of the mid-term exams,
- Passing grade (minimum of 40%) attained on the laboratory report and passing grade (minimum of 40%) attained on the laboratory presentation.
- In order to partake in the laboratory measurements, one must attain a passing grade (minimum of 50%) on the measurement mid-term exam.

**9.4.2. Calculation of the mid-semester grade:**

Mid-semester performance evaluations count toward the mid-semester grade according to the following percentages:

|                                      |                               |                                    |                               |
|--------------------------------------|-------------------------------|------------------------------------|-------------------------------|
| Mid-term exam:<br>(broken down)      | 70% 3 x 50 points             | =min. 40 points/max. 100 points    | Given in percentile           |
| THE:                                 | 30% 3 x 20 points             | =min. 24 points/max. 60 points     | Given in percentile           |
| EXE:                                 | 40% 3 x 30 points             | =min. 36 points/max. 90 points     | Given in percentile)          |
| Measurement mid-term exam:           | 0% 1 x 20 points              | =min. 10 points/max. 20 points     | „≥50% passing”/”<50% failing” |
| Measurement report and presentation: | 30% 1 report + 1 presentation | =min. 8+8 points/max. 20+20 points | Given in percentile           |
| Participation points                 |                               |                                    | Given in percentile           |
| <b>Total:</b>                        | <b>105%</b>                   |                                    | <b>Given in percentile</b>    |

How to calculate grade: 
$$\text{GRADE}[\%] = \boxed{70\% \times \text{Mid-term exam}} + \boxed{30\% \times \text{Measurement report and presentation}} + \boxed{5\% \times \text{Participation points}}$$

**Table of mid-semester GRADE [%]:**

|  |                                   |
|--|-----------------------------------|
| $0\% \leq \text{fail}(1) < 40\%$           | $40\% \leq \text{pass}(2) < 55\%$ |
| $55\% \leq \text{satisfactory}(3) < 70\%$  | $70\% \leq \text{good}(4) < 85\%$ |
| $85\% \leq \text{excellent}(5) \leq 100\%$ |                                   |

**9.5 The students are subject to disciplinary measures against the application of unauthorized means at mid-terms, term-end exams and homework and the application of the 1/2013. (I.30.) Dean’s Order must be followed.**

**10. Retake and repeat**



See above as well as the Code of Studies and Exams of BME.

**11. Consulting opportunities:** According to the consultation schedules of the lecturer, seminar leader, and measurement leaders (see the department web site).

**12. Reference literature (compulsory, recommended):**

- Lajos T.: Az áramlástan alapjai, tankönyv, Budapest, 2008, ISBN 978 963 066 382 3 + free DVD annex (in Hungarian)
- Lajos T.: Fluid Mechanics (course notes in English in PDF) download from the website of the subject, see link below
- Subject web site: <http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATAG11/>

**13. Amount of home study required to pass the subject:**

|  |            |                   |
|--|------------|-------------------|
| Contact hours                            | 70         | h/semester        |
| Home study for the courses               | 28         | h/semester        |
| Home study for the mid-semester checks   | 28         | h/check           |
| Preparation of mid-semester homework     | 22         | h/homework        |
| Home study of the allotted written notes | 0          | h/semester        |
| Home study for the exam                  | 0          | h/semester        |
| <b>Totally:</b>                          | <b>150</b> | <b>h/semester</b> |

**14. The data sheet and the requirements are prepared by:**

| Name:             | Title:             | Affiliation (Department): |
|-------------------|--------------------|---------------------------|
| Dr. János VAD     | full professor     | Dept. of Fluid Mechanics  |
| Dr. Csaba HORVÁTH | assistant profesor | Dept. of Fluid Mechanics  |



## Requirements of the fluid mechanics laboratory measurements

### L.1. Guide to the laboratory measurements

L.1.1. In order to prepare for engineering assignment which need to be solved by conducting fluid mechanics related measurements, students will participate in 7 laboratory sessions (on +/- weeks, depending on the course schedule), to be held in the laboratory of the Department of Fluid Mechanics (BME "Ae" building, ground floor, H-1111 Budapest, Bertalan Lajos street 4-6.). A prerequisite for participating in the measurements is attaining a passing grade ( $\geq 50\%$ ) on the measurement mid-term exam. If the measurement mid-term exam is failed, a written repeat measurement mid-term exam can be taken on the week following the measurement mid-term exam. If the repeat measurement mid-term exam is failed ( $< 50\%$ ), students have one opportunity to take an oral retake measurement mid-term exam with the faculty member leading their seminars, upon payment of an additional charge. Attaining a passing grade on the measurement mid-term exam is a prerequisite for participation in the measurements, and is therefore a prerequisite for passing the course.

L.1.2. The department assigns a measurement assignment to each student who has successfully passed the measurement mid-term exam. Students will be split into measurement groups consisting of 4 students each. Each measurement group will be assigned two assignments (marked "A" and "B"). Two students from among the four (named measurement leaders) will be responsible for the first measurement, marked "A", while the other two students will help execute the measurement. During the second measurement, marked "B", the two students who helped during the first measurement will be the responsible measurement leaders of the "B" measurement, while the measurement leaders of measurement "A" will help execute the measurement.

L.1.3. In the event that the students cannot be organized into groups according to the above mentioned manner, the faculty member in charge of the measurements can organize the students into groups as they find suitable.

L.1.4. Students are given an opportunity to make changes to their laboratory course details until the 3<sup>rd</sup> week of the semester, deterring from what they signed up for in NEPTUN. Free space permitting, students have the possibility to sign up for a different laboratory course. These changes can be made on the department website, under the menu point named "*Measurement registration*". **Those students who have completed the laboratory requirements of the subject in previous semesters are asked to unregister themselves from the laboratory course they have registered for with the help of this website, in order to free up space for other colleagues.** (Changes made on this website, be that registering or unregistering for a given course, does not change ones NEPTUN course information, as this database is independent of the NEPTUN database. The information is a part of the department's own database (named POSEIDON).)

L.1.5. In order to successfully complete a laboratory measurement, all members of the measurement group must be sufficiently familiar with the "*Measurement Guidelines*" of the given measurement, which can be downloaded from the department website. Prior to beginning the laboratory measurement, the faculty member leading the measurements will ask the measurement groups questions, in order to determine the readiness of the group, and if deemed unprepared, the group will be sent home and asked to come back prepared at the time of the makeup measurement. The 4 members of each measurement group, 2 measurement leaders and 2 helpers, are expected to work together on the measurements, according to the instructions of the measurement leaders. All members of the group are responsible for the completion of the measurement. Both of the measurement leaders are responsible for the submission of the laboratory report and laboratory presentation. According to a preliminary agreement between the two measurement leaders, one of the two measurement leaders is responsible for the submission of the laboratory report, while the other is responsible for the submission and presentation of the laboratory presentation. In the case of late submission, repeat submission, etc., additional charges will be charged accordingly. The laboratory reports need to be prepared according to the document entitled "*Formal requirements of the laboratory report and laboratory presentation*", which can be downloaded from the department website. The laboratory report needs to be uploaded to the department website by the given deadline (Midnight of the 2<sup>nd</sup> Sunday following the day of the measurement).

L.1.6. Laboratory presentations, created according to the requirements given in the documentation entitled "*Formal requirements of the laboratory report and laboratory presentation*", for all the measurements, need to be submitted on time and presented by the two measurement leaders during the scheduled time period allotted during the last two weeks of the semester (13<sup>th</sup> and 14<sup>th</sup> weeks). These oral presentations of the measurements should be made with the help of available presentation software. The prerequisite of presenting one's laboratory presentation is having an accepted laboratory report and having one's presentation uploaded on time. The deadline for uploading one's presentation is 8 a.m. of the day on which the presentation is to be held.

L.1.7. Upon completion of the laboratory measurements, the faculty members leading the laboratory measurements, as well as the faculty members grading the laboratory reports, are available for consultation during their official consultation times, in order to answer questions regarding the evaluation of the measurement results. During the 6<sup>th</sup> laboratory session (+11<sup>th</sup> and #12<sup>th</sup> weeks of the semester) students can consult with regard to the presentations, complete makeup laboratory measurements, or carry out supplementary measurements which are to be included in their presentations.

### L.2. Evaluation of work completed in the Laboratory

L.2.1. All laboratory reports which are submitted on time shall be reviewed within 2 working days:: Accepted ( $\geq 40\%$ ), unaccepted ( $< 40\%$ ). The result of the review will be made available to the measurement leader submitting the laboratory report through the POSEIDON network, in the form of a short written evaluation of the work. The laboratory report will be deemed acceptable if the work and the results are well documented, the results are examined from a fluid mechanics point of view, correct conclusions are drawn, and a proper error propagation calculation is made. For further details, see the document entitled "*Formal requirements of the laboratory report and laboratory presentation*". The faculty member grading the laboratory report is available for personal consultation – be the report acceptable or unacceptable – during his or her official consultation period, on the week following the receipt of the laboratory report evaluation.

L.2.2. If the faculty member reviewing the laboratory report deems the laboratory report unacceptable ( $< 40\%$ ), then there is one opportunity to resubmit the report. The corrected laboratory report must be resubmitted within one week of the first review. If the resubmitted laboratory report is also deemed unacceptable ( $< 40\%$ ), then, after payment of an additional charge, the report may be resubmitted one additional time prior to 4 p.m. of the last day of the regular semester. If the report is not submitted on time, or if the resubmitted laboratory report is still considered unacceptable, then there are no further opportunities for correcting the laboratory report, and the laboratory presentation cannot be presented.

The laboratory presentations must be made during the scheduled time periods, which are scheduled for the regular laboratory sessions on the 13<sup>th</sup> and 14<sup>th</sup> weeks of the semester. If the student is unable to make their presentation during their scheduled time period (see the document entitled "*Formal requirements of the laboratory report and laboratory presentation*": e.g. the presentation is deemed



unacceptable <40%; excused absence (see TVSz), etc., or the student does not yet have an accepted laboratory report and is therefore unable to present their results), but has submitted a laboratory report and received a passing grade on it by 4 p.m. of the last day of the regular semester, then, upon payment of an additional charge, can present the laboratory presentation during the scheduled makeup laboratory session scheduled during the repeat exam period. There are no other opportunities given for repeating the presentations, and there are no further opportunities given for improvement.

L.2.3. After the laboratory measurements are completed, during the time periods given in L.1.7., or during a time period agreed upon with the faculty member leading the measurement, opportunities for completing the makeup laboratory measurements or for making supplementary measurements are provided. A measurement group having an accepted laboratory report can conduct supplementary measurements, in accordance with the comments made by the faculty member grading the laboratory report, in order to improve the level of their work and attain extra points. These supplementary measurements should be made prior to the laboratory presentation, during an agreed upon supplementary measurement time period.

L.2.4. Both measurement leaders responsible for a measurement are given the same laboratory report grade (max. 20 points) and laboratory presentation grade (max. 20 points). If the laboratory report or laboratory presentation are submitted late, then not only must additional charges be paid, but the maximum attainable scores are reduced to 50% of the original maximum attainable score, which is 10 points in the case of the laboratory report and 10 points in the case of the laboratory presentation.

L.2.5. Supplement to 1/2013. (I.30.) Dean's Order / Codicil /: The following students are subject to disciplinary measures.

- (a) \*Those students who apply unauthorized means (book, lecture notes, etc.), different from those listed in the course requirements and/or adopted by the lecturer in charge of the course assessment, in the written mid-term exams taken, and/or  
\*invite/accept any assistance of fellow students, with the exception of borrowing authorized means,  
will be disqualified from taking further mid-term exams in the very semester as a consequence of their action. Further to this, all of their results gained in the very semester will be void, can get no term-end signatures, and will have no access to Late Submission option. Final term-end results in courses with practical mark will automatically become Fail (1), the ones with exam requirements will be labelled Refused Admission to Exams.
- (b) \*Those students whose homework verifiably proves to be of foreign extraction, or alternatively, evident results or work of a third party, are referred to as their own, will be disqualified from taking further assessment sessions in the very semester as a consequence of their action. Further to this, all of their results gained in the very semester will be void, can get no term-end signatures, and will have no access to Late Submission options. Final term-end results in courses with practical mark will automatically become Fail (1), ones with exam requirements will be labelled Refused Admission to Exams.
- (c) \*Those students who apply unauthorized means (books, lecture notes, etc.), different from those listed in the course requirements and/or adopted by the lecturer in charge of the course assessment, in the written term-end exams taken, and/or  
\*invite/accept any assistance of fellow students, with the exception of borrowing authorized means,  
will immediately be disqualified from taking the term-end exam any further as a consequence of their action, and will be inhibited with an automatic Fail (1) in the exam. No further options to sit for the same exam can be accessed in the very same exam period.
- (d) \*Those students who alter, or make an attempt to alter the already corrected, evaluated, and distributed test or exercise/problem,
  - i.) as a consequence of their action, will be disqualified from further assessments in the respective semester. Further to this, all of their results gained in the very semester will be void, can get no term-end signatures, and will have no access to Late Submission options. Final term-end results in courses with practical mark will automatically become Fail (1), the ones with exam requirements will be labelled Refused Admission to Exams;
  - ii.) and will immediately be inhibited with an automatic Fail (1) in the exam. No further options to sit for the same exam can be accessed in the very same exam period.

L.2.6. In the case that substantive cooperation and participation in the measurement exercise is not realized, the group will be asked to complete a makeup laboratory measurement. Laboratory measurements missed as a result of an unexcused absence cannot be rescheduled. According to the TVSz, in the case of an excused absence, the measurement should be rescheduled for the makeup measurement session (see L.1.7.), and must submit laboratory reports by 4 p.m. of the last day of the regular semester.

### L.3. Calculation of a student's laboratory report and presentation grade

L.3.1. A student can receive a laboratory report and presentation grade only if they have passed the measurement mid-term exam (min.50%), received a minimum of 40% on the laboratory report for which they were one of the measurement leaders, and received a minimum of 40% on the laboratory presentation for which they were one of the measurement leaders.

In order to complete the measurements successfully, it is important to become familiar with the relevant sections of the textbook Lajos T.: Az áramlástan alapjai (4. kiadás Budapest, 2008, ISBN 978 963 066 382 3). The documents referred to in this documentation can be downloaded from the current semesters folder of the subject, which can be found on the department website:

<http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATAG11/>

Budapest, 2016. September 5<sup>th</sup>

Dr. Vad János, full professor, subject's responsible

