THESIS INFORMATION

on the procedure for issuing the thesis topics, the requirements of the content and
form of the theses in the 3rd year for BSc electrical engineering students

1. THE PURPOSE OF THE THESIS

The engineering student should be independently able to plan, implement and present an engineering-level activity, similarly to real engineering work.

During the work, the students can freely use external sources (with the accurate list of references), but it should be clear what the student's individual contribution and engineering-level activities are.

2. TOPIC OF THE THESIS

Graduates will be employed in engineering and electrical engineering jobs after graduation, so their university studies should prepare them for independent, engineering-level work. The students must be able to plan a system, select system elements and components based on needs, document the work performed, but it is not necessary, e.g. to "discover" new things, to write big new software.

In the electrical engineering department, in the thesis, the candidate must present the solution of an independent engineering task achieved under the guidance of the supervisor and prove his/her own contribution in the defence. The thesis cannot be solely based on the processing of the literature. This requirement must be clearly stated in the task description.

Independent engineering tasks are tasks solved using application-level knowledge in the fields of planning, development, commissioning, operation, service, and maintenance. Examples include (non-exhaustive list) the design and construction of simple analog and digital circuits; design, analysis and testing of electronic equipment and systems; practical application of the principles of electrical and non-electrical measurement methods; the solution of tasks requiring the use of main electrical industry materials and technologies, the application of control engineering devices; solving electrical engineering tasks related to the process of electricity supply and conversion; solving electrical engineering tasks related to basic telecommunication and information communication systems, etc.

For the electrical engineering education, those thesis topics / topic descriptions are suitable, in which the following general, complex electrical engineering knowledge / skills can appear:

- Electricity principles;
- Measurement technical knowledge (measurement range, accuracy, resolution, etc.);
- Basic knowledge of signal processing;
- Electronic (analogue and digital) circuit design, implementation;
- Use of sensors / intervenors;
- Circuit / system planning, implementation, testing, calibration (signal transmission, power supply, efficiency);
- Program development;
- Implementation cost plan;
- Risk analysis (if something goes wrong, what the consequences are);
- Preparation of manufacturability / production documents;
- Documenting and presenting the work.

The subject of Individual laboratory is used for the preparation of the thesis and includes the solution of laboratory and practical tasks related to the thesis.

Students can primarily choose the topic of their thesis from among the topics announced on the website of the Department of Electrical Engineering. Students can apply for the announced topics by submitting the form that can be downloaded from here.

If more than one student applies for a topic, the tutor in charge of the topic selects the student who will develop the topic.

The Department of Electrical Engineering accepts external thesis topics as follows:

1. In the case of external thesis topics, we request a declaration of acceptance from the host company, which includes the student's name, NEPTUN code, specialization, company name, address, name, occupation and contact information of the external (company) consultant, name of the proposed topic, and a brief description, the list of tasks to be developed, the signature of the external consultant. The application form can be downloaded from the website of the Department of Electrical and Electronic Engineering. The Coordinator of Electrical Engineering Bachelor's programme decides on the inclusion of external topics, and the Department notifies the student of this.

   The declaration must be submitted to Dr. Kruppa Andrasne Tunde at the administration of the Department of Experimental Physics, by the specified deadline.

   In addition, the declaration must be sent electronically, in scanned form, to the e-mail address of the Coordinator of Electrical Engineering Bachelor's programme, Dr. Sándor Misák (misak@science.unideb.hu) by 31.01.2023.

2. If the student completed his/her internship at a company and in a topic that he/she can pursue in the form of a thesis, the Coordinator of Electrical Engineering Bachelor's programme (in agreement with the Coordinator of specialization) decides on the acceptance of the thesis topic, based on the acceptance statement (point 1) and the written material submitted for the internship.

3. Topics awarded in thesis tenders announced by large and medium-sized companies (primarily University of Debrecen's industrial partners) must be submitted as described in point 1. The company topics announced on the website of the Department of Electrical Engineering must also be applied for according to the rules for external topics, i.e. the company must accept the student first, and then the student must apply to the Institute according to point 1.

4. In cases not specified in points 2-3, the acceptance of the external topic may only be permitted in professionally justified cases; this must be discussed with the Coordinator of Electrical Engineering Bachelor's programme before submitting the application as specified in point 1.

3. DEADLINES RELATED TO THE THESIS WORK

Updating and publication of the announced thesis topics on the website:	**January 22, 2023.**
Application for the announced topics and submission of external acceptance declarations:	**January 31, 2023**.
Notification on the acceptance of topic proposals/ necessary modifications:	**February 7, 2023.**
Final deadline for topic acceptance:	**February 28, 2023.**

(Note: Assignments must be issued to all students by this deadline. If a student does not choose a topic, or does not submit a topic proposal, or the supervisor does not accept the submitted topic proposal by the above deadline, but the student applied for Individual Laboratory subject in NEPTUN, the Department of Electrical Engineering assigns a topic to the student to develop from among the topics that are still available and appoints the supervisor tutor! In the absence of available topics, we cannot provide/consult on additional internal topics!)

Acceptance of assignments:	**from April 10, 2023**
Deadline for the opportunity to modify the thesis:	**2 months before the deadline for submitting the thesis**
Deadline for submitting of theses:	**date announced by the Dean's Office**

Modification of thesis topic

The thesis topic, with appropriate professional reasons in the first month of the 2nd semester of theses elaboration, can be modified with the approval of the internal consultant and the Coordinator of Electrical Engineering Bachelor's programme if the technical conditions for the elaboration have changed in the

meantime / the candidate is working on a different topic due to a change of job / the modification is justified on the basis of the results received in the first semester of the elaboration of the topic, etc.

The thesis announcement cannot be modified for any reason within 45 days before the thesis submission deadline.

Amendments to the thesis topic specification cannot be supported if the student requests the omission of certain sub-tasks of the valid task specification, or changes to a level that results in a reduction of substantive engineering tasks in the thesis compared to the original specification.

4. INFORMATION ON INDIVIDUAL LAB AND THESIS COURSES

Conditions for acceptance of the Individual Lab and Thesis subjects:

a.) Regular consultation/reporting with the internal consultant (at least 3 times during the semester). Only students who have a consultation form duly completed and signed by the internal consultant may participate in the oral report.

b.) Time-proportionate progress of the thesis task with documentation is required:
   – a minimum of 15 pages of written material for the Individual Laboratory subject and
   – at least 80% completion rate for the Thesis subject.

c.) Successful (at least grade 2) giving of at least 1-1 oral presentation per subject. The presentation must be given in a computerized, PowerPoint program, in 8 minutes, at the time announced by the department, in front of the faculty committee.

5. FORMAL REQUIREMENTS

The thesis should include the official task description.
The thesis consists of **five** main parts:
- **Contents**
- **Explanation of abbreviations and symbols (with units of measurement).**
  If the thesis does not contain many abbreviations (symbols), then it is not mandatory to compile this part. In such cases, after the first use of the abbreviation (symbol) in the text, the explanation should appear in parentheses; e.g. PLC (Programmable Logic Controller).

- **The elaboration part of the thesis:**
  – Introduction (including the exact description of the goal);
  – chapter 1,
  – chapter 2,
  – chapter 3, ... (the chapter titles of the thesis follow the task description);
  – Summary.
- **Bibliography**
- **Appendices**

The chapters and subsections of the thesis should be marked with continuous decimal numbers.

CONTENTS
The table of contents must contain the number marks, titles and page numbers of the main and sub-chapters.

EXPLANATION OF ABBREVIATIONS
Explanations of all abbreviations used in the thesis and letter symbols used in mathematical formulas must be given here. The order of each item should follow the order of first occurrence in the text!

INTRODUCTION / GOALS / MOTIVATION
Its scope is 1-3 pages. The choice of topic must be justified (motivation), the importance and timeliness of the topic must be presented. It should be determined which specific part of the topic, will be discussed in what depth. It should include the objectives of the task to be performed, the method of work leading to it, and structure of the thesis.

ELABORATION PART

The structure of the elaboration should be properly structured, but avoid over-editing (it is advisable to create 3-7 subsections)! The chapter structure of the elaboration part of the thesis and their titles should follow what is included in the task description!

The general structure of the elaboration part:

- Literature history/Overview;
- System design (hardware and software);
- Selection of system elements based on objective system design data;
- Cost plan;
- Hardware and software implementation of the system (design, production, testing, calibration);
- Comparison of the implemented system and the plan;
- Further development / expansion possibilities.

The text of the thesis must be the student's original work! The citations used should be properly indicated! Longer quotations should be included in the appendix or refer to the literature! The reference to the literature, figure, table is indicated in the appropriate place with a number between square brackets, e.g. [1], which refers to the corresponding item in the bibliography. The starting and ending page numbers should also be entered.

The tables and figures placed in the text help with understanding, highlight the most important data, and illustrate what is being said. For tables and figures taken from the literature, the source must be indicated! The results of the work performed must also be expressed in text; a table or circuit diagram is not enough. Tables, figures, and circuit diagrams of specific company documents are in most cases too detailed; it is advisable either to include them in a simplified version in the text or in detail, together with an explanation, in the appendix.

SUMMARY

Its scope is 1-4 pages. Do not include new elements: the description of the thought process, the results proving individual work and the most important suggestions and evaluations should be included here! The text should refer to the introduction, indicate whether the goals set there have been achieved, whether the results meet expectations!

BIBLIOGRAPHY

The items in the bibliography should follow each other in the order of the references in the text! Each item is identified and referenced by a serial number in square brackets, e.g. [1].

APPENDICES

Materials supplementing and illustrating the thesis, and providing some additional details should be attached in the order of reference in the text. The scope should be moderate!

The length of the elaboration part of the thesis: **40-60** pages. This does not include the material in the **Appendices** chapter.

The thesis should be submitted **in black leatherette binding, in 2 copies** (1 original + 1 duplicate).

The following should be placed on the black artificial leather cover in gold:

in the middle:	**THESIS**	
in the lower right corner:		**Name**
		Year

Inner title page:

in the upper left corner: **UNIVERSITY OF DEBRECEN**
Faculty of Science and Technology
Institute of Physics
Department of Electrical and Electronical Engineering
Electrical Engineering BSc

in the middle:	**EXACT TITLE OF THESIS**
in the lower right corner:	Name
	Year

The original copy of the thesis assignment notice and a statement stating that the thesis is the result of the student's individual work must be attached before the inner title page. This is followed by the pages of the developed thesis (table of contents, abbreviations and designations, introduction, elaboration part, summary, bibliography, appendices).

The thesis should be prepared with a suitable text editor with the following settings:

Font:	Times New Roman
Main title:	14-point font size, bold, uppercase, closed in the middle
Subheadings:	14-point font size, bold, left-aligned
Sub/subheadings:	12-point font size, italic, left-aligned
Body text:	12-point font size, 1.5 times line spacing
Paragraph:	indent type first line 0.5 cm, no space between paragraphs
Margins:	left side: 3 cm; right side, bottom and top: 2.5 cm
Header, footer:	distance from page edge: 1.25 cm
Program codes	font: Courier New, font size: 10 points, line spacing: 1x

Each figure should be given a title. The figure number and figure title are located in the middle, below the figure, the font size is the same as the font size of the main text. The figures are numbered continuously (Figure 1, Figure 2, etc.). If the figure is not your own, you should indicate its source (e.g. **Figure 3.** PWM signal shape [4]).

The tables also have a title, which is placed in the middle in front of the table. The numbering of the tables is continuous (**Table 1**, **Table 2**, etc.). If the table is not your own, you should indicate its source (e.g. **Table 1.** LCD display shield pin layout [7]).

The thesis **submission deadline: the end of April and the first half of November** (the exact date will be announced by the Dean's Office).

Graduate students must upload theses to the Electronic Archive of the University of Debrecen (**dea.lib.unideb.hu**) using their Neptun username and password, based on the instructions given in the uploading guide. After successful uploading, the student receives a certificate of uploading his thesis. This certificate is the condition for the student to be admitted to the final exam. You can find information about the order of submission of theses and diploma theses, as well as the process of uploading them, on the website of the Electronic Archive of the University of Debrecen:

(https://dea.lib.unideb.hu/dea/handle/2437/85081).

The duration of the preparation of the thesis is almost one year, and one of the conditions for its acceptance is that within the framework of TTFBL1301 "Individual laboratory" and TTFBG1302 "Thesis" subjects, the student must attend at least 3-3 mandatory consultations per subject (per semester) with the internal institute consultant, as well as giving 1-1 oral presentation per subject.

The task of the internal consultant is to evaluate the student's work on his/her thesis by giving a practical grade on it. The student must obtain the practical grade for the thesis by the last day of the education period.

The form of acceptance declarations and proposals for external and internal thesis topics, as well as the forms confirming the attendance of the consultation, can be found at the administrator of the Department of Experimental Physics, Dr. Kruppa Andrasne Tunde, or can be downloaded from the website of the Department of Electrical Engineering

(https://fizika.unideb.hu/szakdolgozat).

The thesis is the student's original work, which must reflect the student's knowledge of electrical engineering at the Bachelor's (BSc)-level and the ability to **apply the acquired knowledge**.

The thesis is defended within the framework of the final exam, with an 8-minute computer presentation made in PowerPoint. The evaluation is carried out by the final examination committee, taking into account the reviewer's written assessment. The student must bring the assessment sheet to the administrator of the Department of Experimental Physics, Dr. Kruppa Andrasne Tunde, at least three days before the date of the final exam. Theses are also evaluated by internal consultants in addition to external consultants. The internal consultant reviews the work of students who developed an internal institute topic.

A sample form for reviewers of evaluation criteria can be downloaded from the website of the Department of Electrical Engineering (https://fizika.unideb.hu/szakdolgozat).

Debrecen, January / 16 / 2023.

<div align="center">

Dr. Sándor Misák
Coordinator of Electrical Engineering Bachelor's programme,
college associate professor
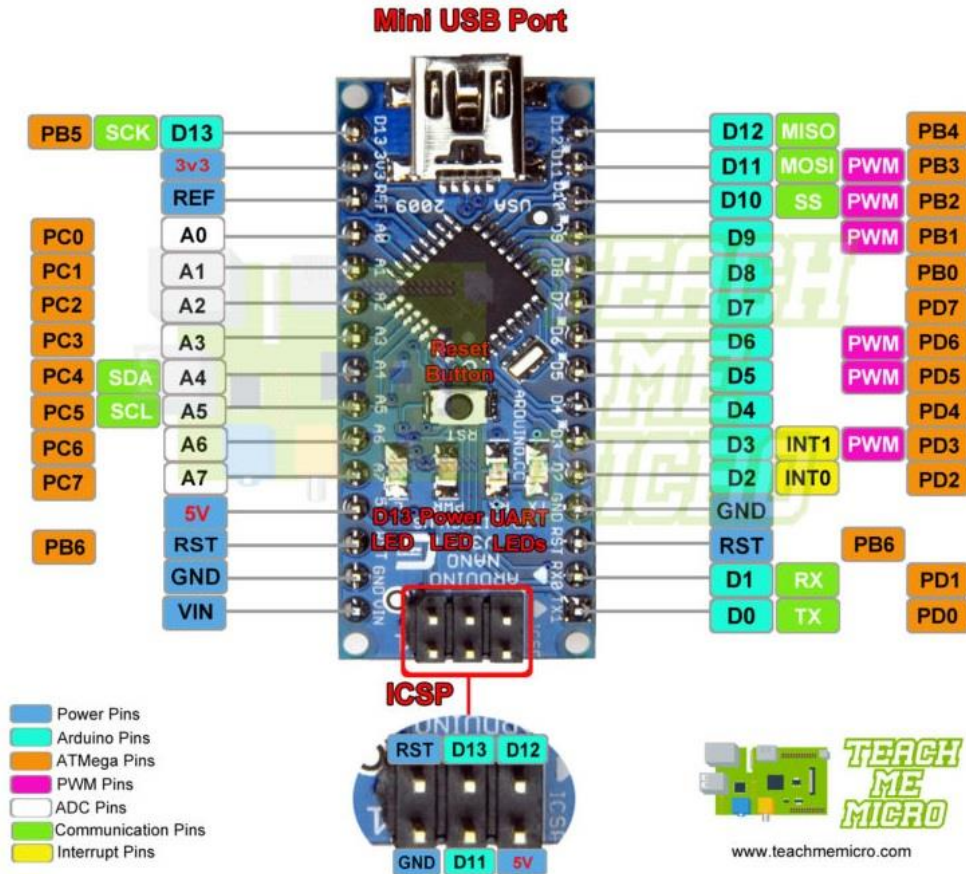
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A P P E N D I C E S

University of Debrecen
Faculty of Science and Technology

Institute of Physics
Department of Electrical and Electronic Engineering

Electrical BSc speciality

EXACT TITLE OF THESIS

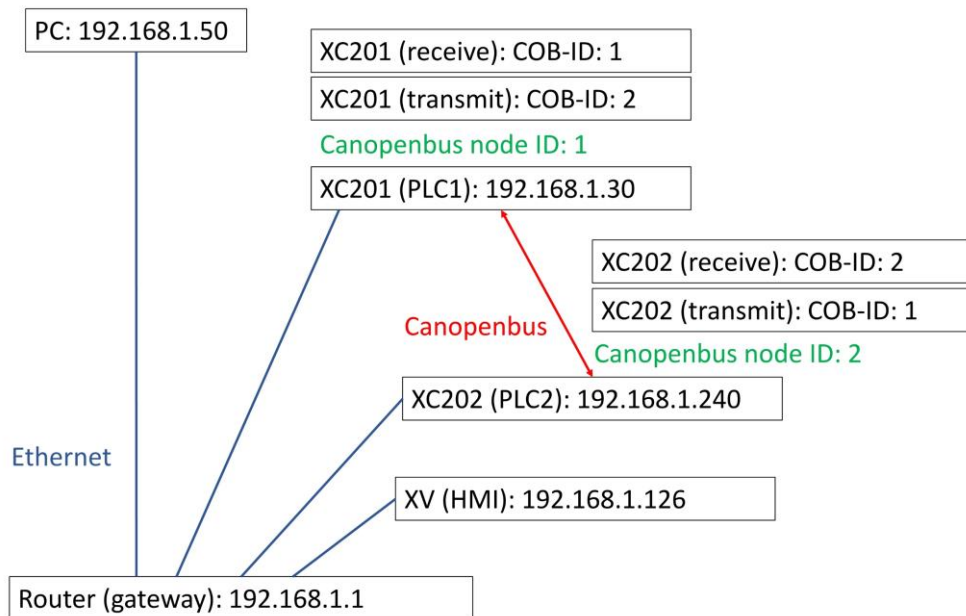John Sample (name)
2023. (year)

Other author's figure (sample):

Figure 1. Arduino Nano development board pinout [1]

Own figure (sample):

Figure 2. Block diagram of PLC test environment (network arrangement)

Other author's table (sample):

Table 1. Technical specifications of Arduino Nano development board [2]

Parameters	Values
Microcontroller type	ATmega328P
Architecture	AVR
Operating voltage	5 V
Input voltage range	7 V – 12 V
Clock speed	16 MHz
Flash-memory	32 kB (2 kB of this used by bootloader)
SRAM	2 kB
EEPROM	1 kB
Digital IO pins	22 (of which 6 can produce PWM-signal)
Analog IO pins	8

Own table (sample):

Table 2. PLC input list

Input field devices	PLC digital input addresses	Comment / Function
Pushbuttons: • Start (NO contact) • Stop (NC contact)	I9 I12	**Start_PB** / machine start **Stop_PB** / machine stop
Sensors: • Level switch (NO contact)	I1	**Level_SW** / mixture level observation − Open contact → there is material in tank − Closed contact → empty tank

References (sample)

(Examples on different source groups presentation in the References)

Internet sources (figures, technical specifications, datasheets, manuals)

1. Arduino Nano development board pinout:

   https://www.teachmemicro.com/arduino-nano-pinout-diagram/ (download time: 2023.01.13.)

2. Technical specifications of Arduino Nano development board:

   https://www.electronicshub.org/arduino-nano-pinout/ (download time: 2023.01.13.)

3. Atmel ATmega328P 8-bit AVR microcontroller with 32K bytes in-system programmable flash. Datasheet (Atmel-7810-Automotive-Microcontrollers-ATmega328P_Datasheet.pdf):

   https://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-7810-Automotive-Microcontrollers-ATmega328P_Datasheet.pdf (download time: 2023.01.13.)

4. Eaton XC300 modular control. Manual (mn050005en.pdf):

   https://www.eaton.com/content/dam/eaton/products/industrialcontrols-drives-automation-sensors/xc-modular-programmable-logic-controllers-(plcs)/xc300-modular-control-manual-mn050005en.pdf (download time: 2023.01.13.)

Books:

5. Dr. Ajtonyi I., Dr. Gyuricza I. Programozható irányítóberendezések hálózatok és rendszerek. Budapest: Műszaki könyvkiadó, 2002.

6. Bolton W. Programmable logic controllers. New Delhi: Newnes (Elsevier), 2008.

Periodic publications (scientific papers, journals):

7. Lekshmi M.S., Arun K., Suja K.J. A microcontroller-based signal conditioning circuitry for acetone concentration detection using a metal oxide-based gas sensor. *J. Comput. Electron.*, **20** (6), 1017-1025 2022.

Theses:

8. Kövér Á. P. Távirányítós robotjármű megvalósítása mikrovezérlővel (szakdolgozat). DE, TTK-Fizikai Intézet, 2018.

9. Hussin A.E.A. PLC based palletizer machine for warehouses (thesis). University of Debrecen, Faculty of Science and Technology – Institute of Physics, 2020.

List of References is continuous. It is unnecessary to highlight different source groups (Internet, book, journal, thesis, etc.)!

See next page!

REFERENCES

1. Arduino Nano development board pinout:
   https://www.teachmemicro.com/arduino-nano-pinout-diagram/ (download time: 2023.01.13.)

2. Technical specifications of Arduino Nano development board:
   https://www.electronicshub.org/arduino-nano-pinout/ (download time: 2023.01.13.)

3. Atmel ATmega328P 8-bit AVR microcontroller with 32K bytes in-system programmable flash. Datasheet (Atmel-7810-Automotive-Microcontrollers-ATmega328P_Datasheet.pdf):
   https://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-7810-Automotive-Microcontrollers-ATmega328P_Datasheet.pdf (download time: 2023.01.13.)

4. Eaton XC300 modular control. Manual (mn050005en.pdf):
   https://www.eaton.com/content/dam/eaton/products/industrialcontrols-drives-automation-sensors/xc-modular-programmable-logic-controllers-(plcs)/xc300-modular-control-manual-mn050005en.pdf (download time: 2023.01.13.)

5. Dr. Ajtonyi I., Dr. Gyuricza I. Programozható irányítóberendezések hálózatok és rendszerek. Budapest: Műszaki könyvkiadó, 2002.

6. Bolton W. Programmable logic controllers. New Delhi: Newnes (Elsevier), 2008.

7. Lekshmi M.S., Arun K., Suja K.J. A microcontroller-based signal conditioning circuitry for acetone concentration detection using a metal oxide-based gas sensor. *J. Comput. Electron.*, **20** (6), 1017-1025 2022.

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9. Hussin A.E.A. PLC based palletizer machine for warehouses (thesis). University of Debrecen, Faculty of Science and Technology – Institute of Physics, 2020.