Call for tenders
"Az ipar az egyetemre megy 2019"
DC/DC Converter Design Challenge Competition and Workshop

Four industry companies (Bosch, PCB Design, TI, WE) are inviting undergraduate students to participate in a Design Challenge. The aim of the competition is to introduce the students to the real demands of engineering by challenging them to design, create, demonstrate and operate a device with strictly specified technical requirements.

The competition enables participants to gain first-hand, industry-related experience, practical employability skills, while working with a set deadline. It is intended to complement the academic curriculum and is used by participants towards their projects.

1 WHO CAN PARTICIPATE AND HOW?

- All undergraduate students who are enrolled to Óbuda University –Kandó Kálmán Faculty of Electrical Engineering in the autumn semester of 2019 (i.e. those who have valid student status).
  Official organizational partner in the organization and on the events: Kandó Kálmán Szakkolégium – http://kkszk.kvk.uni-obuda.hu/.
- To participate on the tender, Applicants need to take subject "Project" or "Projektek az iparból" (KMVPI1TBNE) (only one of them) and start working in realization. Final application is accepted if the mid-semester presentation in front of the expert committee recommends for participation.
- Taking part in the tender is a must to take above subjects but subject is held, managed under the standards of the University the criterias for credit is independent from the tender. The application is valid only if the required documents submitted till deadlines and the device is built.

2 WHEN THE COMPETITION IS CONSIDERED TO BE VALID?

The competition shall be valid only if at least four valid applications are submitted.

3 WHY TO PARTICIPATE?

- To acquire analog design skills
- To learn about latest industry trends
- To receive support from potential employers
- The total remuneration of the tender is around 2000EUR

4 WHAT IS THE AIM OF THE COMPETITION?

The Applicants take the challenge to design and operate a DC/DC converter with as little external support as possible, while

- Selecting the appropriate electronic components and calculating their values
- Producing schematic and PCB designs
- Preparing the bill of material (BOM)
- Assembling and testing the circuit implementation

5 TASKS OF THE APPLICANT

During the Competition, the participating Applicants should:

- Follow the time schedule, get/stay in contact with the organization team.
- Read carefully the documents related to the application.
- Submit a gerber and BOM list till the given deadline.
- Receive the manufactured bare PCB and assembly it with the specified components.
- Make a PCB documentation including test measurements (max 3xA4 pages) and submit before the deadline.
- Participate on the workshop day, measure the EMC parameters, make the live presentation.
- Use the specified components from and defined by Texas Instruments; all other items should be available in Würth Elektronik's portfolio, if possible.

6 DUTIES OF THE SPONSOR

During the Competition, the Sponsor should:

- Inform the applicants about the project details.
- Provide support for the smooth arrangement of the competition
- Provide technical presentations by experts.
- Take part in the evaluation, send delegates to the Committee.
- Arrange 1 PCB per applicants based on the submitted gerber file.
- Make available all the necessary active and passive components. In case any of the components is not available, they should provide the applicants in finding a replacement.
- Offer instruments to perform on-site EMC measurements on the workshop day.
- Evaluate the received tenders and award the best applicants based on their best knowledge.

7 SCHEDULE:

Calendar Week 37:	Take part in the promotion presentation (1-1 campus)
Calendar Week 38-41:	Technical presentations by experts. Preliminary presentations are held at 17:00 on Wednesdays. Presenter companies: Bosch, Eurocircuit, PCB Design, Würth Elektronik.
Calendar Week 44:	Mid-semester document submission, decision for final participation by professor-expert committee. Expected documents: schematics, component

	selection and value calculations, layout drawing. Due to time limitations, committee has a right to limit the number of participant teams by 15.
Calendar Week 45:	Gerber upload to PCB manufacturer Eurocircuit. Manufacturing and delivery of PCB and receiving other active and passive components. (Deadline for gerber and BOM submission is Friday 12:00am). Details revealed during the semester.
Calendar Week 49:	Labor Workshop Day on Wednesday – Measuring the completed boards in time and frequency domain. Final documentation submission by Friday.
Calendar Week 50:	Committee choose the best six teams till Tuesday. On Wednesday the presentation is held in the University in an open event. Final ranking, award ceremony, closure of the project also on Wednesday.

8 TASK DESCRIPTION:

The aim of the design challenge is to develop, build and test a switch mode power supply. A series of presentations by representatives of industry leading companies will be organized in order to help the Applicants understand the practical aspects of designing a DC/DC converter.

Feature	**Value**
Topology	DC/DC Asynchronous Buck
Frequency	50kHz-1MHz
Shielding, housing	External or additional shielding box, shielding material and cabinets not allowed
Max output current	1A
Abs Min Input voltage	6 V
Abs Max Input voltage	18V
Rated input voltage	12V
Output Voltage	5V
Output Power	up to 5W
Output stability	+/-2%
PCB Size, connectors, layers	7x7 cm, 2 layers (see attachment)
Mandatory semiconductor content:	Texas Instruments LM25088
coils, filters, capacitors, spacers etc.	Würth Elektronik
Other passive content	Würth Elektronik

9 APPLICATION SHOULD INCLUDE

- Registration to Subjects in Week 37 as listen Article 1.
- Schematic design, BOM list, component calculations (Week 44)
- Gerber files, final BOM (WK45)
- Develoment documentation (WK48)
- Final power point presentation (WK49)

Applicants should capture schematics using the mandatory LM25088 devices from Texas Instruments. For design purposes, Altium library files are available at ti.com and www.we-online.com.
The schematic design should be submitted **in PDF format**. The schematics should include the values of the passive components, types of coils and filter parts used as well detailed BOM lists. Candidates must use a pre-defined board, as detailed in a separately available PDF. Applicants should present a BOM list along with pricing information including source of price information.

Printed Circuit Board:
Applicants should design a two-layer PCB based on the provided guidelines. Special attention should be taken on the EMC characteristics of the board design from emission perspective. Manufacturing of the boards is delivered by the organizing companies based on the submitted application materials / documentations.

10 REVIEW AND AWARDING SCHEME

The Committee Board will be set up from delegates of the Sponsors (1 per company) and one person from the Óbuda University.
The designs should be submitted by the deadline defined in Paragraph 5, the final evaluation will be carried out after all applicants will have finished their presentation in the presentation workshop.
The final assessment will be based on the following criteria:

- 40% Fulfillment of the technical specification based on submitted technical documentation and workshop measurement results
- 30% Pre-compliance EMC emissions based on workshop measurement results
- 20% Expert opinion (feasibility, manufacturability, cost effectiveness, etc.) based on submitted technical documentation and workshop measurement results
- 10% Presentation – conclusions, implications, results, workshop summary

Each of the design criteria will be ranked from 0 to 100 (best). The sum of the points will determine the order of winners.

EMC expectations:
Peak values in 3 frequency bands are in focus:

1. 0.15-10MHz
2. 54-76MHz
3. 76-108MHz

11 RECOMMENDED REFERENCES

A series of presentations by representatives of industry leading companies will help you understand the practical aspects of designing a DC/DC converter.

Furthermore, you can find further references and tools from Texas Instruments:

- TINA-TI
- Webench
- Power Stage Designer
- https://www.ti.com

and from Würth Elektronik:

- Redexpert
- Trilogy of Magnetics
- https://www.we-online.com
- http://we-online.com/asklorandt

Eurocircuit:

https://www.eurocircuits.hu/pcb-design-guidelines/

12 MISCELLANEOUS

The developed board(s) will remain the property of the Applicant.

Receiving credits for the subject „Project" is solely the right of the leading professior of the subject, independent of the tender.