

TI Innovation Challenge: Europe Analog Design Contest 2015



what is the TI Innovation Challenge: Europe Design Contest 2015?

The Texas Instruments Innovation Challenge: Europe Analog Design Contest 2015 is an initiative to encourage system-level design within universities. It is an opportunity for university students to show creativity and engineering skills whilst working on a design project using TI's broad range of high-performance analog integrated circuits (ICs). This contest allows students to gain experience and recognition in the analog field as well as competing against other teams for cash prizes!

what you can win

First Round: In the first round there will be twenty winning teams. Each of these teams will be awarded a cash prize of US\$ 1,000. These twenty winning teams will progress to the second round of judging.

Second Round: In the second round there will be four winning teams of the contest.

The TOP 4 team prizes will be awarded as follows:

- **First place:** US\$ 10,000
- **Second place:** US\$ 5,000
- **Third place:** US\$ 2,500
- **Fourth place:** US\$ 2,500

Note: All cash prizes will be paid to the team leader of each winning team.

deadlines and important dates

- Registration deadline: 23:59 (GMT) on 28th February 2015
(To register, the team leader should access the [TI IC Europe Portal](#).)
- Tools request deadline: 23:59 (GMT) on 30th April 2015
(Tool requests must be submitted by the team leader through the [TI IC Europe Portal](#).)
- Report submission deadline: 23:59 (GMT) on 31st July 2015
(Reports must be submitted by the team leader through the [TI IC Europe Portal](#).)
- First round winners announced by: 30th September 2015
- Second round winners announced by: 31st October 2015

Recommended tools

Some of our tools are stocked and ready to be shipped; therefore you will be able to start working with them very quickly!

How to get the tools? Find out [here](#).

EVM's (analog tools)

ADC (Analog to Digital Data Converters)

- **ADS8332EVM:** The EVM provides a quick and easy way to evaluate the functionality and performance of this low power, high resolution, Analog to Digital Converter (ADC). The EVM provides a serial interface header to easily attach to any host microprocessor or TI DSP base system.

DAC (Digital to Analog Data Converters)

- **DAC8411EVM:** Evaluation module designed for the prototyping and evaluation of the DAC8411, DAC8311, DAC7311, DAC6311 and DAC5311 digital to analog converters (DAC). These 8 to 16-bit, string DACs operate with a high speed serial clock (up to 50MHz) and offer excellent performance with power consumption as low as 2.5uW.

Power Management

- **TPS54231EVM-372:** The TPS54231 dc/dc converter is designed to provide up to a 2A output from an input voltage source of 3.5 V to 28 V. This evaluation module is designed to demonstrate the small printed-circuit-board areas that may be achieved when designing with the TPS54231 regulator.

IC's and Processors (digital tools)

DSP

- **TMDX5515EZDSP, TMDX5535EZDSP:** These USB Stick Development Tools are a small form factor, very low cost USB-powered DSP development tools which includes all the hardware and software needed to evaluate the industry's lowest power 16-bit DSP.

MCU (Microcontrollers)

- **TMDX28069USB:** The innovative Piccolo controlSTICK allows quick and easy evaluation all of the advanced capabilities of TI's new Piccolo microcontroller for just \$39. Slightly larger than a memory stick, the Piccolo controlSTICK features on board JTAG emulation and access to all control peripherals. Example projects walk the user through the advanced functionality of Piccolo, from simply blinking an LED to configuring the high resolution ePWM peripherals.
- **MSP430 LaunchPad Value Line Development Kit (MSP-EXP430G2):** The LaunchPad is an easy-to-use flash programmer and debugging tool. It features everything you need to start developing on a MSP430 microcontroller device, with an on-board emulation for programming and debugging and features a 14/20-pin DIP socket, on-board buttons and LETs & BoosterPack-compatible pinouts that support a wide range of plug-in modules for added functionality such as wireless, displays & more.
- **MSP430F5529 USB LaunchPad Evaluation Kit:** The MSP430 LaunchPad now has USB! The MSP-EXP430F5529LP LaunchPad (or the "F5529 LaunchPad") is an inexpensive, simple evaluation module for the MSP430F5529 USB microcontroller. It's an easy way to start developing on the MSP430, with an on-board emulation for programming and debugging, as well as buttons and LEDs for simple user interface.
- **MSP430FR5969 LaunchPad Development Kit:** The MSP-EXP430FR5969 LaunchPad development kit is an easy-to-use Evaluation Module for the MSP430FR5969 microcontroller. It contains everything needed to start developing on MSP430's ULP FRAM platform, including on-board emulation for programming, debugging and Energy Measurements. The board features on-board buttons and LEDs for quick integration of a simple user interface as well as a SuperCap allowing standalone applications without external power supply. The MSP430FR5969 device features embedded FRAM (Ferroelectric Random Access Memory), a non-volatile memory known for its ultra-low power; high endurance and high speed write access.
- **MSP-EXP430FR5739:** The MSP-EXP430FR5739 Experimenter supports this new generation of MSP430 microcontroller devices with integrated Ferroelectric Random Access Memory (FRAM). The board is compatible with many TI low-power RF wireless evaluation modules such as the CC2520EMK. The Experimenter Board helps designers quickly learn and develop using the new MSP430FR57xx MCUs, which provide the industry's lowest overall power consumption, fast data read /write and unbeatable memory endurance. The board can help evaluate and drive development for data logging applications, energy harvesting, wireless sensing, automatic metering infrastructure (AMI) and many others.
- **Tiva™ C Series LaunchPad Evaluation Kit (EK-TM4C123GXL):** The Tiva LaunchPad Evaluation Kit is a low-cost evaluation platform for ARM® Cortex™-M4F-based microcontrollers from Texas Instruments. The EK-TM4C123GXL also features programmable user buttons and an RGB LED for custom applications. The stackable headers of the Tiva C Series TM4C123G LaunchPad BoosterPack XL Interface make it easy and simple to expand the functionality of the TM4C123G LaunchPad when interfacing to other peripherals with Texas Instruments' MCU BoosterPacks.
- **C2000 Piccolo LaunchPad (LAUNCHXL-F28027):** The LaunchPad is based on the Piccolo TMS320F28027 with unique features such as 64KB of on board flash, 8 PWM channels, eCAP, 12bit ADC, I2C, SPI, UART, and much more. With all the hardware and software needed to start development, users can focus on learning or developing real-time control systems in areas such as digital lighting, motor control, digital power conversion or precision sensing.

- InstaSPIN™-FOC enabled C2000 Piccolo LaunchPad (LAUNCHXL-F28027F):** The InstaSPIN™-FOC enabled C2000™ Piccolo LaunchPad is an inexpensive evaluation platform designed to help you leap right into the world of sensorless motor control using the InstaSPIN-FOC solution. The LaunchPad is based on the Piccolo TMS320F28027F with unique features such as 64KB of on-board flash, 8 PWM channels, eCAP, 12bit ADC, I2C, SPI, UART, and InstaSPIN-FOC in on-chip execute only ROM memory. The LaunchPad includes many board hardware features such as an integrated isolated XDS100v2 JTAG emulator for easy programming and debugging, 40 PCB pins for easy access to the pins of the F28027F processor, reset button and programmable button, etc., Works with various BoosterPacks.
- BeagleBone Black Development Board (BEAGLEBK):** BeagleBone Black is a low-cost, open source, community-supported development platform for ARM Cortex-A8 processor developers and hobbyists. Boot Linux in under 10-seconds and get started on Sitara AM335x ARM Cortex-A8 processor development in less than 5 minutes with just a single USB cable.

Connectivity (Wi-Fi/Bluetooth/Sub-1Ghz tools)

LaunchPad evaluation kit is a development platform for the CC3200 wireless microcontroller (MCU), the industry's first single-chip programmable MCU with built-in Wi-Fi connectivity. The board features on-board emulation using FTDI device and includes sensors for a full out-of-the-box experience. This board can be directly connected to a PC using software development platforms including CCS and IAR.

- Advanced Emulation BoosterPack for CC3100 BoosterPack (CC31XXEMUBOOST):** This advanced emulation BoosterPack is an accessory for the SimpleLink Wi-Fi® CC3100 BoosterPack. This accessory can be used for Flashing updates to the CC3100B00ST; Using the CC3100 radio tool for RF performance evaluation; Using Simplelink Studio for CC3100 for MCU software development – PC tool, documents and example applications can be found in the CC3100 software development kit (SDK).
- CC1101-CC1190 869 MHz EVM (CC1101CC1190EMK868) Kit:** The CC1101 is a highly integrated and flexible RF transceiver. The CC1101 is primarily designed for use in low-power applications in the 315, 433, 868 and 915 MHz ISM bands. The CC1190 is a range extender for 850-950 MHz RF transceivers, transmitters, and System-on-Chip devices from Texas Instruments.
- EZ430-CHRONOS-868:** The eZ430-Chronos is a highly integrated, wearable wireless development system based for the CC430 in a sports watch. It may be used as a reference platform for watch systems, a personal display for personal area networks, or as a wireless sensor node for remote data collection.
- EZ430-RF2500:** The eZ430-RF2500 is a complete wireless development tool for the MSP430 and CC2500 that includes all the hardware and software required developing an entire wireless project with the MSP430 in a convenient USB stick. The tool includes a USB-powered emulator to program and debug your application in-system and two 2.4-GHz wireless target boards, featuring the highly integrated MSP430F2274 ultra-low-power MCU.

Add-on Modules

BoosterPack

- **430BOOST-C55AUDIO1:** The Audio Capacitive Touch BoosterPack is a plug in board for the MSP430. The kit offers a complete reference design for capacitive touch solutions, using the capacitive touch I/O ports of select MSP430 Value Line microcontrollers. This reference design allows designers to easily control the C5000 ultra-low-power DSP using TI's MSP430 microcontroller for crystal clear playback and record of MP3 audio/voice files.
- **430BOOST-CC110L:** The CC110L RF BoosterPack is a low-power wireless transceiver extension kit for use with the Texas Instruments MSP-EXP430G2 LaunchPad development kit. Based on the CC110L device, the on-board Anaren Integrated Radio (AIR) A110LR09A radio module with integrated antenna operates in the European 868-870MHz band.
- **430BOOST-SENSE1:** The Capacitive Touch BoosterPack is a plug in board for the MSP430. This BoosterPack features several capacitive touch elements including a scroll wheel, button and proximity sensor. Also, on-board are 9 LEDs that provide instant feedback as users interact with the capacitive touch elements.
- **BOOST-CEMADAPTER:** This BoosterPack kit contains one "EM Adapter BoosterPack". The purpose of the EM adapter board is to provide an easy-to-use bridge between any of the TI MCU LaunchPads and the wide variety of TI RF evaluation modules (EM), for instance the CCxxx Low-Power RF evaluation modules.
- **BOOSTXL-C2KLED:** The C2000 LED BoosterPack demonstrates the control of 3 boost converters to drive 3 LED (Red, Green, and Blue) strings. A variety of user interface options are provided including capacitive touch control using an MSP430 and the MSP430 Cap Touch as well as a PC GUI application. This BoosterPack is ideal for real time digital control techniques and LED lighting.
- **SimpleLink Wi-Fi CC3100BOOST:** The SimpleLink Wi-Fi® CC3100 BoosterPack can be used to connect to TI LaunchPad evaluation kits (software examples provided for MSP-EXP430F529LP), and with the Advanced Emulation BoosterPack for SimpleLink Wi-Fi CC3100 BoosterPack to connect to PC for MCU Emulation using SimpleLink Studio for CC3100.

Sensor EVM's

- **LDC1000EVM:** demonstrates the use of inductive sensing technology to sense and measure the presence, position or composition of a conductive target object. The module includes an example of a PCB sensor coil. An MSP430 microcontroller is used to interface the LDC to a host computer.
- **HDC1000EVM:** is a plug and play system to test and evaluate the HDC1000 humidity and temperature sensor. The EVM is a breakable PCB which consists of 3 sections. The first section is a USB to I2C converter based on MSP430F528 microcontroller, the second section is a conversion board (WCSP to SIL 100mil pitch) with the HDC1000 and the third section is a narrow 5mm x 5,5mm pcb with the HDC1000 (WCSP to SIL 50mil pitch) which allows to reduce the thermal mass of the system (sensor + pcb). Both second and third section can be used for remote measurements. The HDC1000EVM does not need additional hardware, calibration nor does it require any software programming - only the HDC1000EVM GUI has to be installed.
- **TMP75BEVM for Digital Output Temperature Sensor:** The TMP75B is a digital output temperature sensor capable of reading temperatures of -40°C to +125°C with 12 bits (0.0625 C) of resolution. The TMP75B uses a two-wire I2C protocol SMBus interface that allows up to eight devices on one bus. It is ideal for extended temperature measurement in communication, computer, and consumer, environmental, industrial, and instrumental applications.

Recommended parts

The amount of different ICs from TI can be overwhelming. Please see the following list for short overview of recommended devices.

How to get the ICs? Find out [here](#).

Data Converters (ADC's & DAC's)

General-Purpose ADC

- **THS1206M**: 12-bit, 6-MSPS A/D converter, quad-channel, integrated 16x FIFO, channel autoscan, low power.

Instrumentation ADC

- **ADS1258**: 24-bit, fast channel cycling $\Delta\Sigma$ ADC

High-Speed ADC

- **ADS1605**: 16-bit, 5-MSPS $\Delta\Sigma$ A/D converter
- **ADS1606**: 16-bit, 5-MSPS single-channel $\Delta\Sigma$ ADC with FIFO

General-Purpose DAC

- **DAC8554**: 16-bit, quad channel, ultra-low glitch, voltage output D/A converter Projects: Portable instrumentation, closed-loop servo-control.

High-Precision DAC

- **DAC8534**: 2.7-V to 5.5-V, quad-channel, 16-bit, serial input DAC
Projects: Portable instrumentation, programmable attenuation, and PC peripherals.

High-Speed DAC

- **DAC8581**: 16-bit, high-speed, low-noise, voltage output D/A converter
Projects: CRT projection/TV digital convergence, waveform generation and ultrasound projects.

Power Management

Low-Dropout Regulator (LDO)

- **TPS73501**: Single-output LDO, 500-mA, adjustable, low quiescent current, low noise, high PSRR

Multi-Cell Li-Ion Charger

- **bq24750A**: Host-controlled, multi-chemistry battery charger w/integrated system power selector. Projects: Notebook PCs, portable DVD players.

Power Sequencer

- **UCD9080:** Power supply sequencer and monitor. Projects: Telecommunications switches, servers, networking equipment and test equipment

LED Driver

- **TLC5940:** 16-channel LED driver w/EEPROM dot correction and grayscale PWM control
Projects: Mono-color, multi-color, and full-color LED displays, LED signboards and display backlighting

AC/DC Controller

- **UCC28600:** 8-pin quasi resonant fly back green-mode controller
Projects: Supplies for LCD monitors, LCD -TV, PDP-TV and set-top boxes, AC/DC adapters and offline battery chargers

Buck/Boost for Portable Applications

- **TPS63000:** 96% buck-boost converter with 1.8-A current switches in 3x3 QFN Projects: Portable audio players, PDAs, cellular phones and personal medical apps
- **TPS62400:** Dual, adjustable, 400-mA and 600-mA, 2.25-MHz step-down converter with 1-wire interface in QFN
- **TPS61200:** 0.3-V input voltage boost converter with 1.3-A switches and down mode in a 3x3 QFN Projects: Portable media players, digital radio, digital cameras, fuel cell- and solar cell-powered projects

Wide-Input Buck

- **TPS5430:** 5.5-V to 36-V, 3-A, 500-kHz step-down SWIFT™ converter
- **TPS40200:** Wide input non-synchronous buck DC/DC controller. Projects: Set-top boxes, DVD, industrial and car audio power supplies, distributed power systems and DSL/cable modems.

High-Current Buck

- **TPS54010:** 2.2-V to 4.0-V, 14-A synchronous step-down SWIFT™ converter
- **TPS40055:** Wide input (8V-40V) up to 1-MHz frequency synchronous buck controller, source/sink Projects: Broadband, networking, optical communications infrastructure and industrial servers

MOSFET

- **CSD16413Q5A:** N-channel NexFET™ power MOSFET

Wi-Fi IC's

- **CC31xx:** - 2.4GHz, SimpleLink WiFi LaunchPad Family Solutions. Connect any low-cost, low-power microcontroller (MCU) to the Internet of Things (IoT). The CC3100 wireless networking solution is part of the new SimpleLink Wi-Fi family that dramatically simplifies the implementation of Internet connectivity. The CC3100 device integrates all protocols for Wi-Fi and Internet, which greatly minimizes host MCU software requirements.
- **CC32xx:** - 2.4GHz, SimpleLink WiFi LaunchPad Family Solutions. Start your design with the industry's first single-chip microcontroller unit (MCU) with built-in Wi-Fi connectivity. Created for the Internet of Things (IoT), the SimpleLink CC3200 device is a wireless MCU that integrates a high-performance ARM Cortex-M4 MCU, allowing customers to develop an entire application with a single IC.

Sensor IC's

- **LDC1000: Inductive** Sensing is a contact-less, short-range sensing technology that enables low-cost, high-resolution sensing of conductive targets in the presence of dust, dirt, oil, and moisture, making it extremely reliable in hostile environments. Using a coil which can be created on a PCB as a sensing element, the LDC1000 enables ultra-low cost system solutions.

Amplifier IC's

Instrumentation Amp

- **INA118: Precision**, low-power instrumentation amp

Op Amps

- **OPA277: High-precision** op amp, single
- **OPA2277: High-precision** op amp, dual
- **OPA4277: High-precision** op amp, quad
- **TS12A4517: Low-voltage**, low on-state resistance SPST CMOS analog switches

MCU & RT Processors

MSP430 Ultra-low Power MCUs

- **MSP430FG4618: Integrated** signal chain: ADC, DAC, op-amps, 16MHz, LCD controller
- **MSP430F5438: Next-generation** MSP430, ADC, 256-KB memory, 25MHz
- **MSP430F169: General-purpose** MCU, ultra-low power, 64-KB memory
- **MSP430F2013: DIP** package available, ultra-low power, smallest MSP430, easy to use

C2000 Real-Time Control MCUs

- **TMS320F28335: Floating** point, 150MHz w/ hi-res PWMs

Recommended software

There are several software tools that could be useful in your project. You can download software (limited versions) for free from the TI website. Just follow the links by clicking on the software name.

Software Tools and Packages

Design

- **Code Composer Studio: Integrated** development environment for Texas embedded processor families. CCStudio comprises a suite of tools used to develop and debug embedded applications. Please use time-limited or code-limited license.
- **WEBENCH Power Designer:** You can use WEBENCH to create customized power supplies or DC-DC converters for your circuits. This environment gives you end-to-end power supply designs and prototyping tools.
- **WEBENCH SensorAFE Designer & WEBENCH Sensor Designer Tools:** These tools provide complete sensor circuit design for common sensing, transmitter, and transducer applications. You can start with an industry standard sensor or specify your own sensor requirements to create your own custom sensor. WEBENCH sensor tools provide you with optimized signal path performance, bill of materials, budgetary cost, and links to evaluation boards and other tools for testing and validating your simulated solution.
- **WEBENCH Filter Designer:** The WEBENCH Filter Designer lets you design, optimize, and simulate complete multi-stage active filter solutions within minutes. Create optimized filter designs using a selection of TI operational amplifiers and passive components from TI's vendor partners.
- **SmartRF Studio:** Can be used to evaluate and configure Low Power RF-ICs from Texas Instruments. The application will help designers of RF systems to easily evaluate the RF-ICs at an early stage in the design process.

Utility

- **Tiva C Series MCUs PinMux Utility :** The Tiva C Series PinMux Utility allows a Tiva C Series MCU developer to graphically configure the device peripherals intuitively and rapidly. This tool provides an easy-to-use interface that makes setting up alternate functions for GPIOs easy and error-free.

Simulation

- **TINA TI:** Easy-to-use, powerful circuit simulation tool based on a SPICE engine. TINA-TI is a fully functional version of TINA, loaded with a library of TI macromodels plus passive and active models.

Software & Code Packages

- **MSP430 Ware** (already part of CCS installation): Collection of code examples, datasheets and other design resources for ALL MSP430 devices delivered in a convenient package - essentially everything developers need to become MSP430 experts!
- **Control Suite:** Cohesive set of software infrastructure and software tools designed to minimize software development time. From device-specific drivers and support software to complete system examples and technical training, controlSUITE™ provides libraries, examples, and support at every stage of development and evaluation.
- **TivaWare for C Series:** TivaWare software for C Series is an extensive suite of software tools designed to simplify and speed development of Tiva C Series-based MCU applications. All TivaWare for C Series software has a free license, and allows royalty-free use so users can create and build full-function, easy-to-maintain code.

- SimpleLink WiFi Starter:** The SimpleLink™ Wi-Fi® Starter mobile App is a convenient tool for users to configure, connect, and communicate to the CC3100 BoosterPack or the CC3200 LaunchPad.
 This application uses TI SmartConfig™ Technology to easily provision CC3100 and CC3200 devices. The app helps users find SimpleLink Wi-Fi devices connected to the network using the mDNS function under Devices tab. Now talking to your Wi-Fi device is simple.
- SimpleLink WiFi CC3200 SDK:** The SimpleLink™ Wi-Fi® CC3200 SDK contains drivers for the CC3200 programmable MCU, 40+ sample applications, and documentation needed to use the solution. It also contains the flash programmer, a command line tool for flashing software, configuring network and software parameters (SSID, access point channel, network profile, etc.), system files, and user files (certificates, web pages, etc).

How to order tools and samples?

- Samples - chips produced by TI
- Tools - development boards sold by TI to evaluate its chips

Both samples and tools are different products and must be ordered differently.

Ordering Samples

Please ask your Professor to order samples for your team as students may face problems. You will find a guideline for ordering tools in the next section of this document. The European University Program does not send any samples. All samples are provided through TI's sampling program and the standard TI sampling rules apply.

- If your Professor is not registered on my.ti.com, they must register with a university .edu email address.
- Find a product page on ti.com. Click [Free Samples](#) under [Sample & Buy](#) button.



- Select a preferred device package and click [Free Sample](#)

Free Sample

- You can order up to 5 units of 8 different items. Ensure that the number in QTY column is correct. Remember to click [Update](#).

Update

- In the Justification field type "Texas Instruments Innovation Challenge: Europe Analog Design Contest 2015".
- Save your order number! It might be needed if you will experience any issues.

Please provide requested information below to continue checkout

*Required to comply with customs and government regulations

⚠ Provide a justification for the samples you are requesting
 - You are requesting a large quantity of samples

Texas Instruments Innovation Challenge: Europe Analog Design Contest 2014

* Samples will be shipped to

GERMANY [\(Edit\)](#)

* Select your application

HealthTech

* Select your end equipment

Patient Monitoring

* Are you or is this sample request intended for use by a military entity?

Yes No

* Do you accept TI's [Terms and](#)

[Conditions](#) for the provision and receipt of TI Samples? Yes No

Check Out

ordering tools

The team leader must login to the tool request page on the **TI IC Europe Portal** and submit the teams' tool request online. The tool request must be \$100 or less and must only include tools. ICs are not allowed to be ordered and will not be accepted as part of the tool request. Tool requests must be made before the deadline: **23:59 (GMT) on 30th April 2015**.

We advise you to firstly check the **Recommended List** available on the tool request page of the **TI IC Europe Portal** for the most popular tools. If the tool you want is not on the Recommended List, use the **Freeform** and fill in the part number, website hyperlink and price.

Notes:

- No PO Box Addresses will be accepted in the shipping address.
- Do not order samples this way.

<http://www.ti.com/tool/> ← This is a valid tool page.

<http://www.ti.com/product/> ← This is not a valid tool page. Requests from such pages will be rejected.

non-EU participants

import charges?

TI ships tools from its European (EU) warehouse. This means that for non-EU participants, shipments of tools could be subject to local import duties (such as VAT) and customs clearance charges on arrival in your country. These charges are your responsibility. **They will not be paid by TI under any circumstances!**

what can you do to avoid import charges?

In order to try to avoid such charges we recommend the following:

- Use your professor and your University as the shipping address, rather than your home or lodging address.
- Purchasing the tools you need from a Local Distributor in your country may be easier for some items and avoids all import charges (We do not give teams cash. You will have to pay for the tools yourself).

help

1. We encourage you to have a discussion with your professor.
2. TI E2E™ community e2e.ti.com

report

You can use software of your choice in order to write your report but your report **must** be submitted in **PDF, DOC or DOCX-format** with a maximum size of **30MB**. Your team leader must login to the **TI IC Europe Portal** and submit the project report online by **23:59 (GMT) on 31st July 2015**.

We recommend following structure:

1. Title page
2. Introduction
3. Motivation for project
4. Theoretical background
5. Implementation
6. Experimental results
7. Conclusions
8. Summary
9. Future plans
10. Bill of materials

technical requirements

Please remember that projects that do not meet the requirements might receive lower points from the judges.

- Total 10 pages maximum (plus 1 page extra, only for complete bill of materials).
- Font size must be equal to or greater than 12pt (except for the abstract where the minimum is 10pt.)
- Language: English
- Page size: A4 (ISO 216)
- Margins: Top, Bottom, Left and Right: 1" (Normal)
- File format: PDF, DOC or DOCX-format
- Must include:
 - Detailed written description of the design and a specific description of how each Texas Instruments analog IC or processor benefited the overall design.
 - Clear block diagram of device
 - List of **all** components used in your project (part manufacturer, part number and quantity)
- Maximum file size is **30MB**

Your project should follow typical guidelines for technical paper: clear & simple technical language, schematics & plots should be properly marked. Remember that visual appearance is important.

title page

The title page **must** include:

- Team leader name and email address
- Project title
- Assistant Professor name and email address
- Team member names and email addresses
- University name and Country
- Project abstract under 250 words (cannot be located even partially beyond title page)
- Part number with quantity and embedded link to product page at www.ti.com
- Date of submission
- Picture of the team and picture of the project

We recommend using a **template** that is available to download at www.ti.com/tiic-eu. You are free to change the layout as long as the requirements remain unaffected.

judging criteria

The Texas Instruments Innovation Challenge: Europe Design Contest 2015 involves two rounds of judging:

- **First Round:** Each design report will be judged by at least two competent Tiers, who are experienced in analog and systems design. There will be twenty winning teams selected from Round 1.
- **Second Round:** The top twenty winning teams from the first round will automatically proceed to the second round of judging. These top twenty teams will compete against each other to win the "Chairman's Award". Each of these twenty design reports will be judged by a panel of three judges: two university professors and a competent non-TI industrial professional.

In both rounds, the total score that the judges give each design report will determine the winning teams. All judges for the contest are required to be fair and impartial.

Below are the judging criteria which each design report will be marked against during both rounds of the contest. The reports are judged based on 6 different criteria, on a scale from 0-10, where scores can be any number between 0-10. Each criterion is worth a maximum of 10 points, with 10 points being exceptional, 5 points being average and 0 points being no competence.

The six judging criteria are:

- **Idea/Concept/Originality:**

When thinking about a new idea, keep in mind that you will need to solve a problem that has not been addressed before or plan alternative ways of solving an engineering problem of today.

Think about innovative applications such as: driver assistance systems, smart grid, energy harvesting, power management, hybrid/electric power train systems, wireless connectivity technology, passive safety, lighting systems that solve a mechanical problem (i.e.in the automotive field), motor drive, smart buildings, infotainment, etc.

 - **10 Points:** A unique idea.
 - **5 Points:** An average idea that other people have used before but new ideas have been added.
 - **0 Points:** An idea used many times in the past with well-known applications.
- **Engineering:**

Once your team's idea is ready, you will need to look at your project from a systems perspective. What are the blocks needed to complete your design? This is your chance to show your engineering skills. You might want to get inspired by looking at many of TI designs: www.ti.com/tidesigns > Search by application (e.g. automotive, factory automation and control, etc).

 - **10 Points:** High quality of engineering displayed. A deep analysis of the methods and tools chosen. Clear analysis of the results with the best approach being used to achieve the results.
 - **5 Points:** Good engineering skills displayed with some analysis of the methods and tools chosen. The methods chosen were not the best way to achieve the desired result.
 - **0 Points:** Poor engineering skills displayed with no analysis of the methods and tools chosen. No analysis of the results provided.
- **Analog:**
 - **10 Points:** High competence and ability in the Analog field. Appropriate tools have been used in the design report. Excellent understanding of analog principles.
 - **5 Points:** Some competence in the Analog field displayed. Some use of appropriate tools. Some understanding of key analog principles.
 - **0 Points:** No ability or understanding demonstrated in the Analog field and appropriate tools were not used.
- **Benefits of chosen TI tools/devices:**
 - **10 Points:** Excellent analysis of TI tools/devices chosen and the benefits that they provide. Tools/devices chosen are the most appropriate available.

- **5 Points:** Good analysis of TI tools/devices chosen. Tools/devices chosen are a good choice but better alternatives could have been used.
- **0 Points:** No discussion of the benefits of TI tools/devices chosen. Poor choice of tools/devices and not suitable for application.
- **Practicality:**
 - **10 Points:** Design developed and built by the team. Design worked and successfully met the objectives set out.
 - **5 Points:** Design did not fully work. Clear analysis provided as to why the design did not work or meet the desired objectives.
 - **0 Points:** Design is not built or is built but does not work. No analysis is proved as to why the design did not work or meet the desired objectives.
- **Report Quality:**
 - **10 Points:** High quality design report that clearly conveys the chosen idea and work carried out. Relevant diagrams and illustrations are used. Design report is well structured and easy to understand.
 - **5 Points:** Average quality design report with limited structure. Some diagrams and illustrations are used.
 - **0 Points:** Low quality design report which is poorly written and structured. No diagrams or illustrations are used and design report is hard to understand.

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