

2015 美國機械工程師學會(ASME)



學生競賽(SPDC) 國內賽簡章

壹、前言：

美國機械工程師學會(ASME) 成立於 1880 年，學會為一非營利事業組織，致力於促進工程科學界的技術合作、知識共享以及技能發展，並提升工程師在學會中的重要性。學生競賽(Student Professional Development Conference, SPDC)共分成三個層級，分別為國內賽、區域賽和總決賽，每個階段的優勝者可以代表參加下一層級的比賽，本次 ASME SPDC 競賽屬於國內賽，成績優勝隊伍可晉級參加 ASME 在世界上數個地點所舉辦區域賽的參賽資格。若在區域賽競賽中再次獲得佳績，則可參加 SPDC 全球總決賽（為 ASME International Mechanical Engineering Congress & Exposition (IMECE)會議中一個項目），與來自全球各區的優勝隊伍一較高下。

貳、競賽宗旨：

- 一、提供培養專業機械工程師、領導人的技術平台。
- 二、創造國際間工程技術分享與交流。
- 三、提供參賽學生認識美國機械工程師學會的機會。

參、辦理單位：

主辦單位：美國機械工程師學會 台灣分會



協辦單位：國家實驗室研究院 儀器科技研究中心



承辦單位：美國機械工程師學會 清華大學學生分會

贊助單位：美商國家儀器股份有限公司 台灣分公司



財團法人自強工業科學基金會



國立清華大學 動力機械工程學系

肆、競賽方式：

本次 ASME SPDC 競賽屬於國內賽，成績優勝隊伍可晉級參加 ASME 在世界上數個地點所舉辦區域賽的參賽資格。若在區域賽競賽中再次獲得佳績，則可參加 SPDC 全球總決賽（為 ASME International Mechanical Engineering Congress & Exposition (IMECE)會議中一個項目），與來自全球各區的優勝隊伍一較高下。

伍、競賽項目：

國內賽包含二種項目：

1. Student Design Competition 學生設計競賽：

2015 年 SPDC 設計競賽題目為 Robots for Relief。請依照題目設計出作品進行參賽。
詳細規格請參照附錄一。

依 ASME 過去數年慣例，競賽規則會隨參賽者反應而時有修訂，請參賽隊伍主動注意總部規則修正，相關資訊可由此獲得：

<https://www.asme.org/events/competitions/student-design-competition>

2. Old Guard Oral Presentation Competition 演講競賽：

演講題目不限，機械相關即可，全程以英文演講和問答。詳細資訊請參照附錄二。比賽評審重點在大學生個人對機械相關議題的分析與分享能力或是個人在學期間研究成果的發表，並不是英文能力的鑑定。

陸、參賽資格：

國內大專院校全職在學學生（非研究生），在職進修學生及教師不受理報名。學生設計競賽可跨院校混合組隊，每組最多 4 人。演講競賽則限以個人為單位參賽。報名表請見附錄三。

柒、參賽方法：

參賽者可自行選擇欲報名參加之項目，並於國內賽之前完成作品或簡報，在國內賽當日前往比賽地點進行競賽。優勝隊伍或個人可獲得獎金以及 ASME 台灣分會所頒發的證書。

美商國家儀器並提供學生設計競賽參賽隊伍嵌入式系統 NI myRIO 的免費租借服務，租借辦法請參照附件四。myRIO 相關資訊請參閱下方連結

myRIO - Project essentials guide：<http://www.ni.com/white-paper/14621/zht/>

myRIO - 3 hours seminar manual：<http://goo.gl/VrC5nO>

myRIO - 線上教學短影片：<http://taiwan.ni.com/myrio/video>

捌、競賽流程：

學生設計競賽：

競賽當天會場備有準備區，參賽選手可以在準備區做最後的調整測試工作，在正式開始前的一小時，將開放參賽者檢視比賽場地，並在開始前 10 分鐘收回各隊的遠端控制器，交回時請參賽者自行關閉電源，之後依序取回進行比賽，順序將以抽籤方式決定，詳細競賽流程將於當天宣布或以行前通知方式告知。

演講競賽：

競賽現場提供電腦與投影機，參賽者僅需自備內含簡報檔之隨身碟或光碟。

玖、評分標準：

由美國機械工程師學會台灣分會邀請學業界專家組成評審團，並按照美國機械工程師學會頒佈之評分標準進行評分。各項競賽的評分準則請見附錄。

拾、競賽獎項與獎金：

獎項和獎金原則上依下方設定品項頒發，實際頒發獎項得因參賽隊伍數目和比賽成績狀況從缺。

一、學生設計競賽：

第一名：50,000 元

第二名：20,000 元

佳作：10,000 元 (一名)

美商國家儀器特別獎：10,000 元（三名，得與上述獎項合併領取。本獎項主要頒發給參賽作品中有使用到美商國家儀器相關產品之隊伍。若隊伍使用免費租借之 NI myRIO，獲獎隊伍可保留 NI myRIO，細節請參照附件四。）

二、演講競賽：

第一名：5,000 元

第二名：3,000 元

拾壹、競賽時間與地點：

2015 年 3 月 8 日 星期日。

詳細時程安排會公布於競賽網站上

國家實驗研究院 儀器科技研究中心 (新竹市科學園區研發六路 20 號)

交通資訊：<http://www.itrc.narl.org.tw/Intro/Route/>

(如遇不可抗拒之因素，主辦單位得更改競賽時間與地點)

主辦單位提供參賽者午餐

拾貳、報名辦法：

報名時間：即日起至 2015 年 2 月 2 日截止。

報名表：請見附錄三。

保證金：一隊 1000 元整，比賽結束後，退還全額保證金 1000 元。

報名時請使用郵局現金袋郵寄。內含：報名表、參賽成員學生證正反面影本、保證金 (現金袋內現金只接受鈔票，如有收據請妥善保管)，詳細填寫後寄至：

(30013) 新竹市清大郵局 2-264 號信箱

拾參、聯絡資訊：

ASME 學生競賽(SPDC)國內賽 總召 翁子翔 0972-185-685 roger5641@gmail.com

ASME 學生競賽(SPDC)國內賽 副召 賴昱廷 0911-888-293 taitungkevin@yahoo.com.tw

拾肆、競賽網站：

相關資訊會公布在網站上，請密切注意。

Facebook 搜尋: **ASME SPDC 台灣國內賽**

American Society of Mechanical Engineers

Student Design Contest

Robots for Relief 2014-2015 Contest

Design Problem Description

Delivering aid, including clean water, food, fuel, and medical supplies to places, such as the Philippines after Typhoon Haiyan, is a difficult task, as transporting bulk materials over uneven and rough terrain, in tight spaces, and over long distances is often required to help those in need.

This year's challenge is to design and develop a scaled-down version of a transporter capable of delivering granular materials, which will be guided by, at most, one person.

The engineering design constraints and evaluation procedures for your device are as follows:

- In order to verify the feasibility of your design concept, you must build and test a prototype system which will be capable of efficiently transporting a variety of granular materials (e.g., rice, beans, etc.) through water and sand as well as up and down a stair setup, as shown in Figure 1, and empty as much of the granular material as deemed appropriate into a receiving container within a three-minute time limit.
- In the three-minute competition period, you may load your device and complete as many round trips as your team sees fit.
- You can only place the material in your device in the loading area and can only empty it into the receiving area from the discharge step.
- In order to make multiple trips, you must return to the loading area by traversing the entire course.
- The amount of material transported per trip is up to each team and the design of their transporter.

The competition course is designed to capture the various challenges that a vehicle might see in the real world. As such, the granular material delivered needs to be “edible” once delivered, and therefore neither damaged nor contaminated.

Design Specifications:

1. The device must be powered by rechargeable batteries. No other sources of energy are permitted. This precludes the use of preloaded springs, charged capacitors, compressed gas canisters, and related systems. Note that battery packs ARE allowable as long as they are made up of rechargeable batteries and that this is easily verified by the competition's judges.
2. All rechargeable batteries used must have clearly documented energy capacity – rated voltage and current capacity (milliamp-hours). Teams must be able to demonstrate this to the judges.
3. The device must be controlled either through a transmitter/receiver radio link or through an umbilical cord. An umbilical cord controller may not contain any batteries. As an exception to the battery rule, a radio transmitter may have its own batteries. These batteries do not have to be rechargeable and will not be included in the scoring calculation of energy capacity. The transmitter/receiver radio link may be any commercially available model controller. All radio controllers will be impounded and shut off at the competition, except during the team's run.
4. Mechanical forces on the umbilical cord may not be used to help propel or control the vehicle. The umbilical cord must be detachable from the vehicle using a commercial connector. The umbilical cord may not be a part of the supporting structure of the device. The umbilical cord may only be used to transmit the commands from the controller. Teams will be disqualified if, at any time, the umbilical cord is used to apply mechanical force to the device.
5. Before the trial begins, the device must fit inside a 25 cm x 25 cm x 30 cm rectangular box, which is provided by your team. If your box is part of your design, then the external dimensions must be no larger than the 25 cm x 25 cm x 30 cm rectangular box. The device must be fully assembled as it comes from the box. There is one allowable exception: antenna wires may “spring up” on their own, and remain upright, without penalty, even if they extend beyond the size constraint, as long as the device is controlled by a wireless radio transmitter/receiver pair.

6. You will begin in a square loading area measuring 40 cm on each side. Team members can load and interact with their device in this area only. Before the trial the entire device must be completely within this area (except for any control umbilical cable and controller or antenna). Teams will be provided 1 minute to set up their device, and then will have 3 additional minutes to fill their device with the granular material, and deliver as many loads as possible. Note that teams do not have to use the entire 3 minute competition period. The amount of time utilized will be a strong function of the team's strategy.
7. You must climb a ramp that is between 75 cm and 125 cm long with a rise of at most 10 cm. The ramp will touch the ground at the edge of the loading area and end at the water section. The ramp will be 40 cm wide, may be made of random construction materials (wood, metal, plastic etc.), and may have an uneven surface or some small holes.
8. You must pass through a water section 40 cm by 40 cm by at most 10 cm deep.
9. You must pass through a sand section 40 cm by 40cm by at most 10 cm deep. This sand may be uneven.
10. You must traverse three 40 cm by 40 cm steps of unequal height. The height of each step will be between 5 and 20 cm.
11. There will be a 10 cm diameter hole centered in the top step, into which your material must be delivered. Only material that falls through the hole will count towards the useable payload score.
12. If your material is wet or sandy (as determined by the judges), the material will not count as part of your score.
13. If you touch your device after it has left the loading area, your team will be disqualified.
14. During the trial, the device must be completely controlled via the radio or umbilical controller; no other contact, interaction, or influence is permitted. One team member must control the device (either via wireless or umbilical) throughout the trial. When umbilical cords are used, additional team members are permitted to use poles or rods to guide the umbilical cords during the trial.
15. Throughout the trial, no team member is permitted to touch the course or the receiving container. If the team wishes to repair their device, they must do so in the loading area.
16. The transporter is to climb the stairs by placing its weight successively on sequential stair treads. At any time after leaving the base surface (floor), the weight of the transporter may not be supported by more than two stair treads. The ramp, sand, water, and stairs may not be bypassed by going directly to the top platform or dumping directly into the receiving container.
17. There are no guard rails or curbs on the ramp, steps, or the top platform.
18. Practice runs will not be allowed on the actual contest stairs at the competition sites. The actual course at the competition site will be available for inspection at least one hour prior to device judging and impounding.

At the end of the trial, the granular material in the receiving container will be weighed and the team with the maximum total score will win. Scoring is based on the following equation

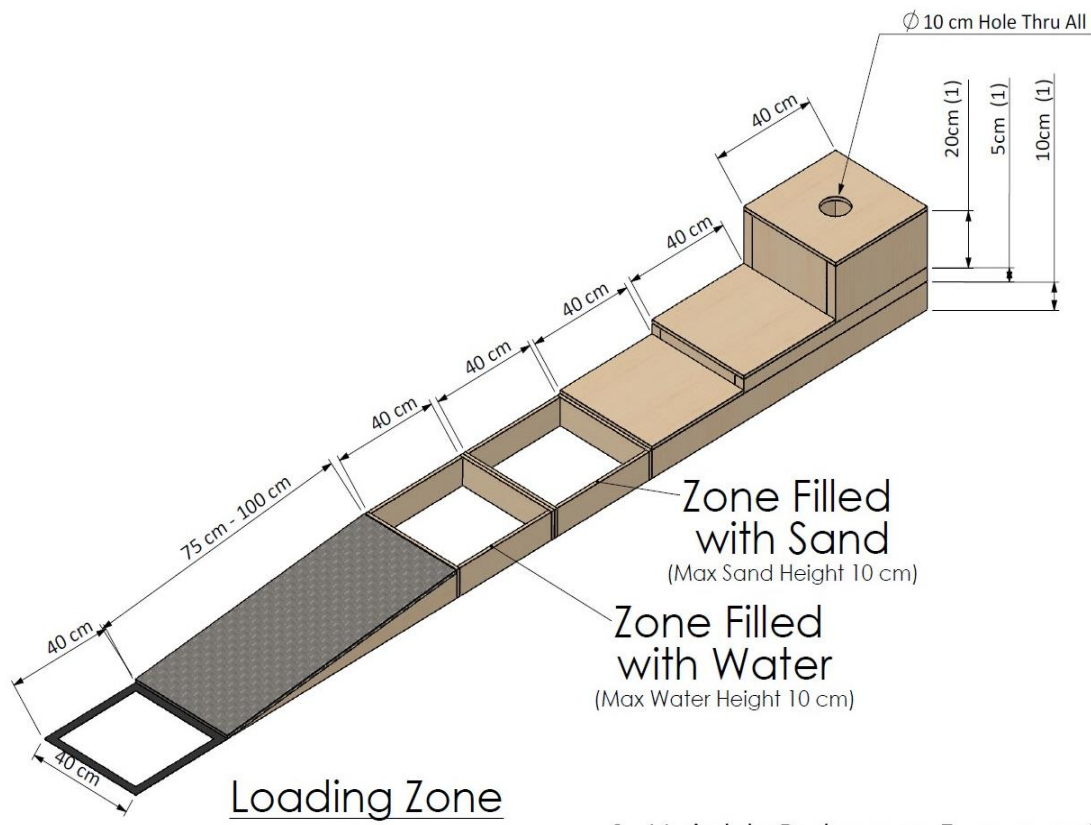
$$S = \frac{\text{usable payload}}{\text{time} * \text{energy capacity}}$$

where:

- S is the team's total score
- Usable payload is measured in grams
- Competition time is measured in seconds (maximum: 180 sec.)
- Energy capacity is measured in Volts*milliAmpere-hours

There will be awards for the following:

- 1st place: Maximum Total Score
- Best Use of Advanced Manufacturing (judges' discretion)
 - o A one page report is to be submitted when the team registers for the Student Professional Development Conference. The report will explain how the team used Advanced Manufacturing in the design of their vehicle.
- Best Use of Predictive Design and Simulation Tools (judges' discretion)
 - o A one page report is to be submitted when the team registers for the Student Professional Development Conference. The report will explain how the team used Predictive Design and Simulation Tools in the design of their vehicle.



1. Heights Between 5 cm and 20 cm

Old Guard Oral Presentation Competition

Rules and Procedures

Like all professionals, engineers must possess a well-developed ability to synthesize issues and communicate effectively to diverse audiences. Among the highlights of ASME's Student Professional Development Conference (SPDC) program is the Old Guard Oral Presentation Competition. This competition is designed to emphasize the value of an ability to deliver clear, concise and effective oral presentations, particularly pertaining to some sphere in which an engineer is or should be involved.

Each student presentation lasts fifteen minutes and is followed by a five minute "Question and Answer" (Q&A) period. First Place winners from each of the District Conferences are invited to compete at the Society level at the International Mechanical Engineering Congress & Exposition.

Each presentation in the Oral Presentation Competition must be delivered in English. The subject matter of each presentation must address a technical, economic or environmental aspect of engineering or other basic engineering theme, provided it pertains to some sphere in which an engineer is or should be involved. A major portion of a competitor's total score is based on the judges' evaluation of his/her relative capability to communicate orally, including evidence of a talent to respond effectively in the Q&A period.

A competitor may utilize any available resource but must realize that the presentation is to be an individual effort. Assistance in the use of visual aids is advisable (Powerpoint, etc.). Film clips, if used, may not exceed one-minute total duration (i.e. a maximum of one minute of each student presentation may be used for video). Film clips may not be accompanied by any recorded sound. Good practice and courtesy suggests credit be given during the presentation for any outside help related to the reported project. A written paper or manuscript is not required.

Eligibility and Requirements

To be eligible to participate, each competitor must be a Student Member who:

- a. has not yet received an engineering degree* and,
- b. has been selected by his/her Student Section or ME Department to participate; and,
- c. is a Student Member in good standing.

* Student Members who complete the requirements for their baccalaureate engineering degree, or who actually receive that degree at the end of a term, semester, or quarter a short time before a scheduled conference may still participate. These Student Members, however, must not have completed their degree requirements before December 1 of the calendar year prior to the Conference.

At least two (2) weeks before the date of the District Conference, each participant's Student Section Advisor of his/her Student Section (or Department Head, if there is no Student Section) shall advise the Student Section Advisor of the host institution and ASME Staff of the names of their competitors and titles of their presentation (ASME Staff can be reached at oldguard@asme.org).

Competition Entry

The Old Guard Oral Presentation Competitions are held locally at ASME Student Professional Development Conferences (SPDCs). Students who wish to participate must:

- Visit the Student Professional Development Conferences website.
- Choose the location of the conference he/she plans to attend.
- Complete the appropriate entry form for that location.

Students entering the Old Guard Oral Competition may not enter the Old Guard Technical Poster Competition.

There is no restriction on entering the Old Guard Technical Webpage Competition..

Conduct of the Contest

Each presentation in the Old Guard Competition shall be made by one contestant. Any questions regarding procedure shall be resolved by the Student Section Advisor and District Leader before the Conference.

The Chair of the Host Student Section usually presides during the contest and ensures that there is adherence to the time schedule given in the printed program. The Presentation's duration is fifteen (15) minutes plus five (5) minutes for Q&A immediately thereafter. Any time remaining or exceeding the fifteen minutes must be added to or subtracted from the five minute discussion.

Questions may be asked by any attendee of the competition except those from the competitor's own educational institution. Each person posing a question to a speaker must stand, identify himself/herself and school, and then proceed with the question. The Host Student Section must appoint two timekeepers from two visiting student delegations. Timekeepers must be non-contestant Student Members. They are to be introduced by name and college at the beginning of each session and instructed to keep time as follows:

- At the end of twelve minutes, the first timekeeper will rise to signal to the speaker that there are three minutes remaining.
- After the speaker nods to acknowledge the signal, the timekeeper will sit down.
- At the end of fourteen minutes, the second timekeeper will rise to signal to the speaker that there is one minute remaining.
- After the speaker acknowledges the signal, the timekeeper will sit down.
- At the end of fifteen minutes, both timekeepers will rise together and remain standing until the speaker concludes the presentation.
- Both timekeepers will rise at the end of five minutes to terminate the discussion period.

Judging and Scoring Criteria

Each contest is to be judged by the same individuals throughout, preferably ASME members of mature judgment, who are selected along with one or two alternates. Local ASME Sections and District Leaders will be pleased to cooperate in the search for judges. As an alternative, some Districts use one faculty member and one student from each represented school as judges, with the faculty and student not judging their own presenter(s).

The Presentations will be judged in four categories; Content, Organization, Delivery and Effectiveness, and Discussion.

Content

To what extent is the subject of interest to a technical audience? Is credit given for source of material or contribution by others? How much knowledge of subject was exhibited? Is work independent and original? Is the subject technical or general in nature?

Organization

Is there any novel approach to the subject? Is there sufficient background information provided in order to introduce the audience to the subject? Are the facts developed in logical and continuous sequence? Is there a definite conclusion, and was it adequately based on the facts or data presented?

Delivery and Effectiveness

Are the words distinctly pronounced and was proper volume used to be heard by all? Is proper English used, and is the vocabulary sufficient? Is personal appearance appropriate? Are there any distracting mannerisms? Is the manner of delivery (conversation, memorized, read from manuscript) satisfactory? If visual aids are used, how effectively are they used? Is the presentation within the time limit of 15 minutes allowed?

Discussion

Is the presentation evoking spontaneous questions from the audience? Are the questions indicating the need for clarification of facts presented, or were they merely of the type seeking additional information? How readily and with what self-assurance did the speaker answer the questions? Are the answers indicating knowledge of the subject beyond that disclosed in the original presentation? Is the ability to think clearly demonstrated?

Judges are to use the Scoring Sheet provided (see Appendix A) as the basis for judging all the Student Professional Development Conferences. The Scoring Sheet has been developed for the convenience of the judges in evaluating the presentation in competition. Scoring Sheet samples should be sent to the judges for familiarity ahead of the contest. Scoring

Sheets are not to be given to the presenters. Judges should be informed that they must agree to serve through the entire contest, be it one or two days.

Judges are encouraged to fill out the Feedback Sheet (see Appendix B) on each student's presentation and give them to the contestants at the conclusion of the presentations. The Feedback Sheet has been developed for the convenience of the judge to assist him/her in this process.

District Awards and Recognition

Each Student Member that participates in the District competition will receive an ASME membership upgrade to Member, compliments of the Old Guard.

Judges at each conference are to select First, Second, Third and Fourth Place winners based on the criteria specified in the competition score sheet. A Fifth Place winner may be selected, at the judges' discretion. An additional award is available for "Best Technical Content." This prize may be given to one of the top four winners or any other presenter at a conference.

Student Conference (SPDC) Awards		Society Awards (Finals at IMECE)	
First	\$500.00 plus a trip to compete in the final competition at ASME's IMECE	First	\$2,000.00
Second	\$150.00	Second	\$1,500.00
Third	\$100.00	Third	\$1,000.00
Fourth	\$50.00	Fourth	\$500.00
Fifth		\$25.00	
Technical		\$50.00	

Competition Finals

Each ASME District is entitled to select one (1) Old Guard Oral Presentation finalist at its Student Professional Development Conference (SPDC) to represent the District at the finals of the Old Guard Oral Presentation Competition. Finals take place at the International Mechanical Engineering Congress and Exposition (IMECE) in November. North American Districts choosing to have more than one Student Professional Development Conference in a given year are entitled to select a maximum of two (2) Oral Competition winners, but no more than one per conference.

No substantial changes from the presentation given at the District Student Professional Development Conference may be made for the finals at IMECE. Any substantial change of title or major revision of the presentation given at the District SPDC will result in disqualification and may result in loss of travel reimbursement.

The final competition at IMECE is judged by a panel of volunteers from within the ASME community, based on the same criteria as the District events. The top four presenters among the finalists are eligible for Society awards. The winners are also recognized at Society events and featured in various ASME publications and web sites.

Adopted by the Old Guard Committee

August 11, 2011

2015 年美國機械工程師學會(ASME)學生競賽(SPDC)國內賽報名表

一、參加項目：

☐ Student Design Competition 設計競賽

隊伍名稱：

☐ Old Guard Oral Presentation Competition 演講競賽

※附註：設計競賽組隊報名人數至多四人，演講競賽限以單人報名。

二、參賽名單：

指導教授		姓名		
		E-mail		
隊長	姓名		連絡電話	
	學校/科系		E-mail	
隊員	姓名		連絡電話	
	學校/科系		E-mail	
隊員	姓名		連絡電話	
	學校/科系		E-mail	
隊員	姓名		連絡電話	
	學校/科系		E-mail	

※附註：若為單人報名，填寫隊長欄位即可。

三、注意事項：

1.隨報名表請附上參賽成員學生證正反面影本以及保證金(一隊 1000 元整)。

2.每參加一項競賽請填寫一份報名表。

3.報名日期：即日起，至 2015 年 2 月 2 日截止。

4.詳細填寫後寄至：

(30013) 新竹市清大郵局 2-264 號信箱

5.聯絡人：

ASME 學生競賽(SPDC)國內賽 總召 翁子翔 0972-185-685 roger5641@gmail.com

ASME 學生競賽(SPDC)國內賽 副召 賴昱廷 0911-888-293 taitungkevin@yahoo.com.tw

2015 美國機械工程師學會(ASME) 學生競賽(SPDC) 國內賽 美商國家儀器科技 (NI) myRIO 借用辦法

國內賽基本資訊：

- 一、競賽時間：2015 年 3 月 8 日
- 二、競賽地點：國家實驗室研究院 儀器科技研究中心
- 三、主辦單位：美國機械工程師學會 台灣分會
- 四、協辦單位：國家實驗室研究院 儀器科技研究中心
- 五、承辦單位：美國機械工程師學會 清華大學學生分會
- 六、贊助廠商：美商國家儀器科技股份有限公司
- 七、競賽網站：Facebook 搜尋 **ASME SPDC** 台灣國內賽

借用辦法：

一、申請資格：

已報名參加 2015 ASME SPDC 國內賽之隊伍。

二、借用儀器設備：

由美商國家儀器根據各隊伍所提交之構想書進行選核，借用 NI myRIO 控制器一套。

NI myRIO 控制器之相關資訊參閱下列網址：

myRIO - Specifications: <http://www.ni.com/myrio/zht/>

myRIO - Project essentials guide : <http://www.ni.com/white-paper/14621/zht/>

myRIO - 3 hours seminar manual : <http://goo.gl/VrC5nO>

myRIO - 線上教學短影片：<http://taiwan.ni.com/myrio/video>

三、申請方式：

- 欲申請 myRIO 借用之競賽隊伍，請於 103 年 12 月 31 日(三)前將競賽構想書（附件五），以電子郵件方式寄至美商國家儀器姜長青工程師(email: chang-ching.chiang@ni.com)，逾期恕不受理。
- 競賽構想書由美商國家儀器科技全權選核，選核標準將以構想書內容之創新性、實用性、可行性、與完整性為主。收件後採隨到隨審，於 1 週內完成審核和 myRIO 寄件程序。

四、本補助辦法未盡事宜，主辦單位保留隨時解釋、修正內容之權力。

2015 年美國機械工程師學會(ASME)學生競賽(SPDC)國內賽 競賽構想書

競賽隊伍名稱				
指導教授	姓名		連絡電話	
	學校/科系		E-mail	
隊長	姓名		連絡電話	
	學校/科系		E-mail	
隊員	姓名		連絡電話	
	學校/科系		E-mail	
隊員	姓名		連絡電話	
	學校/科系		E-mail	
隊員	姓名		連絡電話	
	學校/科系		E-mail	

競賽平台構想概述(至多 2 頁，含圖片)：

技術特點及預期成果(至多 2 頁，含圖片)：