
*Quality assessment of the Crete Intensive Programme (IP)
four months after its end*

Erasmus+ project ELBYSIER (Electronics for the Beyond Silicon Era).

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Rationale

In April 2017, a survey was dispatched to participants at the Crete Intensive Programme which was organized by the ELBYSIER team in October 2016. The purpose of this questionnaire was to help ELBYSIER partnership to understand what elements of the Intensive Programme the students have implemented between four and six months after the end of the IP.

The survey itself is available (annex 1 of this document).

Eleven (11) participants took part in the survey which is a sufficient completion rate.

Survey results

Participants had different study levels (undergraduate, graduate and postgraduate) as figure 1 shows.

Study level

11 responses

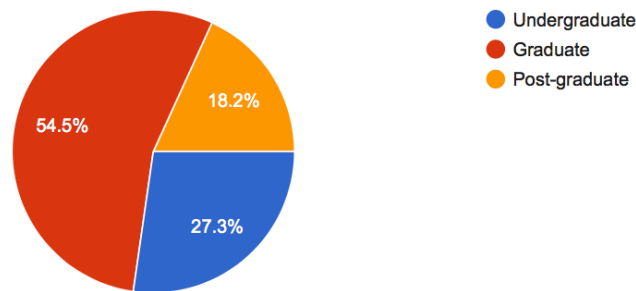


Figure 1: study level and institution

Participants from all universities except the University of Bucharest and the University of Saint-Etienne joined the IP (figure 2).

Institution

11 responses

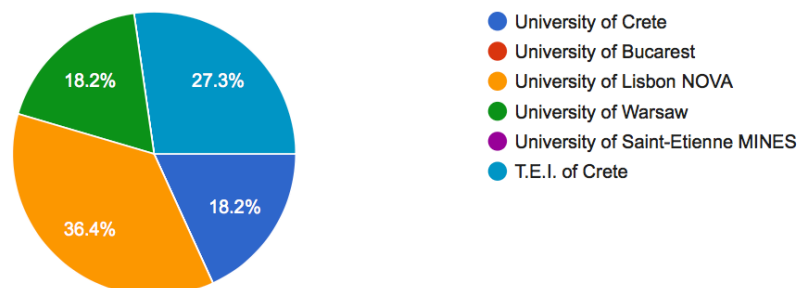


Figure 2: institution

Asked to provide a summary of what they learned during the IP, students provided the following questions.

- *It was a long time ago, but one that I remember for sure was organic transparent electronics¹.*
- *I have earned some knowledge about Organic, Transparent and Paper electronics, applications on Biomedical electronics and a few deeper informations about graphene, graphene oxide and it's applications mostly on solar panels.*
- *The most important think was the communication with people from different topics. Also the fact that every topic can fill some vacancies from yours. Specifically, the knowledge that we earn on flexible electronics is of a major importance for me.*
- *new tecnologies*

¹ All replies verbatim

- *A lot of new knowledge on topics that I am interesting. In spscific on transparent conductive materials, gas sensing, photocatalysis, materials for managing solar energy/heating.*
- *I've learned about semiconductor physics and applications*
- *In elbysier intensive programme we had a lot of modules about graphene properties and its applications, as well as biosensors applications. We also learned some theory about semiconductors. And a big part of the course it was about flexible and transparent electronic, focused on fabrication and characterization of the materials and transistors, using different kind of substrates as paper and some polymers, and rigid substrates too.*
- *We learned on the transparent semiconductor/conductors, both on the material side fundamentally and its aplications as on TFTs and Solar cells, gas sensors, etc. We also discussed on biosensors, and its aplications on interfacing with the brain. Other topics were also learned such as graphene for photovoltaics, metal-meshes for display technology, and paper substrates/dielectrics for TFTs.*
- *Some general ideas on transparent electronics and the different techniques used depending on the field.*
- *Transparent electronics and their abilities*
- *I learnt about transparent electronic materials and some applications of these materials. I learnt about graphene, mainly what has been done with this material and some of its challenges.*
- *I have learned about bioelectronics in general and using bioelectrochemical devices and microcircuits to monitor and measure biological signals. In particular interesting was for me the use of transistors based on organic semiconductors that are capable of using biological signals as inputs in order to amplify them. Moreover, the course was helpful in developing cognitive functions and soft skills through several activities for instance: presentations and paper preparation.*
- *I became aware of existence and main trends of field of bio materials (especially biopolymers) and using them in medicine: diagnosis, drugs delivery, neuroscience... I learned many things not exactly in my field of interests but this school provides me very fresh knowledge, interesting on some point, giving me possibility to look at my own work from the different angle. Moreover I learnt much about publishing and presenting my work to other people.*

When asked about any difficulties students have encountered, they offered the following feedback.

- *No (2)*
- *Rather not.*
- *Difficulties in understanding*
- *No difficulties. Everything was clear.*
- *I had no problems*
- *No, because I only used theory from what I learned, so I had no difficulties to use this knowledge*
- *Yes, because it was too much information to take in regarding a variety of subjects.*
- *I'm conducting research about transparent and conductive oxides and even though I'm still developing the material, this programme provided me with some ideas where to apply this material.*

When asked about the ways that students have implemented knowledge acquired through this particular IP, we gathered the following replies.

- *Me and Bartłomiej Seredyński (with some help from Mary Donahue) are trying to build QuantumOLED's. I presented a poster (last time in France) that showed some of our initial*

work. Now we are going to present some solid results in Thessaloniki on Nanotechnology 2017 conference.

- *The benefit was to learn and understand the new directions that the technology is moving to and I have already observe that everything is following the same route. Transparency.*
- *Helped me to understand more deep the gas sensing technique for transparent materials and so explain better some results from my master thesis and consequently managed to published them.*
- *The implementation of what I learned from the ELBYSIER is maily concentrated on looking new direction of research and solving problems on my research.*
- *I've learned how to improve semiconductor devices and how transparent electronics affects on our life.*
- *In my PhD i am working with semiconductor nanostructures for transparent and flexible electronics, and for this work a lot of new ideas and concepts have been used by me.*
- *Working with IGZO TFTs as part of my PhD work plan, i've implemented some of the theoretical knowledge that was passed on this area, namely on the transparent flexible electronics.*
- *I haven't yet implemented what I learned, because I'm in the process of learning, but some of the topics discussed in the symposium were approached in subjects I studied and this way I was able to consolidate knowledge.*
- *This course allowed me to expand my knowledge about transparent electronics. And it gave me some ideas where to apply the material that I'm developing in my research.*

In the following question, students were asked to assess whether they have used knowledge offered through the ELBYSIER IP in Crete in their current practice (i.e. after the end of the IP).

Have you utilised knowledge from any of the modules below? [Transparent Electronic Materials for Gas Sensing]	Have you utilised knowledge from any of the modules below? [Transparent Amorphous Oxide Semiconductors & Devices]	Have you utilised knowledge from any of the modules below? [Chemistry of Graphene & Graphene Based on Materials for OPVs]	Have you utilised knowledge from any of the modules below? [Flexible amorphous semiconductor thin film transistors]	Have you utilised knowledge from any of the modules below? [Oxide Nanoparticles based electrical & electrochemical devices on paper substrates]	Have you utilised knowledge from any of the modules below? [Interfacing with the brain using organic electronics]	Have you utilised knowledge from any of the modules below? [Interfacing with the brain using organic electronics]	Have you utilised knowledge from any of the modules below? [Flexible oxide electronics]	Have you utilised knowledge from any of the modules below? [P-type Transparent Oxide Thin Film Transistors Processed in low temperatures]
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No	Yes	Yes	No	Yes	No	Yes	Yes	Yes
Yes	No	Yes	No	No	No	Yes	No	No
Yes	No	No	No	No	Yes	Yes	Yes	No
No	Yes	No	No	No	Yes	Yes	Yes	No
Yes								
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	No	Yes	Yes	No	No	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No	Yes	No	Yes	No	No	No	Yes	No
No	Yes	No	Yes	Yes	No	No	Yes	No
No	Yes	No	Yes	Yes	No	No	Yes	No
No	Yes	Yes	Yes	No	Yes	No	Yes	Yes
Yes	Yes	No	No	No	No	No	Yes	No

Have you utilised knowledge from any of the modules below? [Laser Processing of 2D nanosheet based materials]	Have you utilised knowledge from any of the modules below? [Metal Oxide Nanosurfaces and heterointerfaces for solar harvesting applications]	Have you utilised knowledge from any of the modules below? [Semiconductors Transparent for Visible Light]	Have you utilised knowledge from any of the modules below? [Oxide TFTs]	Have you utilised knowledge from any of the modules below? [Developing New Functional Transparent Conductors]	Have you utilised knowledge from any of the modules below? [Graphene - flexible transparent and conducting material for nanotechnology]	Have you utilised knowledge from any of the modules below? [Exploiting the Surface for the next generation of Eco-Systems on Foil Technology]	Have you utilised knowledge from any of the modules below? [An Introduction to Neural Networks]	Have you utilised knowledge from any of the modules below? [An Introduction to Biosensors]	Have you utilised knowledge from any of the modules below? [Transparent conductors : A bird's eye perspective]	Have you utilised knowledge from any of the modules below? [Thermoelectric performance of transparent oxide semiconductor films and superlattices]	Have you utilised knowledge from any of the modules below? [Engineering TCMs for high efficiency photo – electrochemical cells]	Have you utilised knowledge from any of the modules below? [Thin Film device applications with transparent amorphous SiInZnO semiconductors]	Have you utilised knowledge from any of the modules below? [Functional photocatalytic films for green buildings: from fundamental science to engineering]
No	No	Yes	No	Yes	No	No	No	No	Yes	No	No	No	No
No	No					No					No		No
Yes	No	No	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	No
Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No	No	Yes	Yes	No	No	No	No	No	No	Yes	No	No	No
No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No

No	No	No	No	No	No	No	No	No	No	No	No	No	No
Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No
	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No

Have you utilised knowledge from any of the modules below? [Graphene transparent conductive film; progress, challenges and progress]	Have you utilised knowledge from any of the modules below? [Hydrogen and stability in oxide semiconductors]	Have you utilised knowledge from any of the modules below? [The Global Materials Network for Young Researchers]	Have you utilised knowledge from any of the modules below? [Embedded metal mesh as transparent conductors and its application for touch panels]	Have you utilised knowledge from any of the modules below? [Fighting Youth Unemployment using MOOCs]
No	No	No	No	No
		Yes		
Yes	No	No	No	Yes
No	Yes	Yes	Yes	No
Yes	Yes	Yes	Yes	Yes
No	No	Yes	No	No
No	Yes	No	No	No
No	No	No	No	No
	No	Yes	Yes	No
No	No	No	No	No

Table 1: value of knowledge acquired through the Crete IP to professional development of participants

Conclusion

Results of the post-training survey show very encouraging results on the level of success of the IP (no difficulties encountered after the course end) and of uptake (students mention having used knowledge acquired through the IP in their professional context).

Participants to the course document both expert knowledge but also social value gained through the course, which is certainly a success indicator.

Despite the low number of respondents (three participants) the results of the post-training survey are very positive. Participants have valued the expert content offered but also social aspects and collaborative work which was triggered at the course.

In addition, all students for almost all modules offered claim having used knowledge of these modules after the end of the IP.

The positive results of the Crete IP build on the engaging and supportive environment ELBYSIER offers to participating staff and students.

Annex 1: survey

Post Course Questionnaire, six months after the Intensive Programme held in Crete, October 2016

The purpose of this short questionnaire is to help us assess the impact of the Intensive Programme that you attended in October 2016 in Crete in your professional career. Please help the project team to report to the Funding Agency the added-value of this Intensive Programme.

First name

Last name

Study level

- 1.Undergraduate
- 2.Graduate
- 3.Post-graduate

Institution

University of Crete
University of Bucarest
University of Lisbon NOVA
University of Warsaw
University of Saint-Etienne MINES
T.E.I. of Crete
Other...

Please provide a summary of what you learned during ELBYSIER Intensive Programme (Crete, October 2016)

Long-answer text

Have you encountered any difficulties in implementing what you learned

on the Intensive Programme? Please provide details

Long-answer text

Have you utilised knowledge from any of the modules below?

	Yes	No
Transparent Electronic Materials for Gas Sensing		
Transparent Amorphous Oxide Semiconductors & Devices		
Chemistry of Graphene & Graphene Based on Materials for OPVs		
Flexible amorphous semiconductor thin film transistors		
Oxide Nanoparticles based electrical & electrochemical devices on paper substrates		
Interfacing with the brain using organic electronics		
Interfacing with the brain using organic electronics		
Flexible oxide electronics		
P-type Transparent Oxide Thin Film Transistors Processed in low temperatures		
Laser Processing of 2D nanosheet based materials		
Metal Oxide Nanosurfaces and heterointerfaces for solar harvesting applications		
Semiconductors Transparent for Visible Light		
Oxide TFTs		
Developing New Functional Transparent Conductors		
Graphene - flexible transparent and conducting material for nanotechnology		
Exploiting the Surface for the next generation of Eco-Systems on Foil Technology		
An Introduction to Neural Networks		
An Introduction to Biosensors		
Transparent conductors: A bird's eye perspective		
Thermoelectric performance of transparent oxide semiconductor films and superlattices		

Engineering TCMs for high efficiency photo – electrochemical cells		
Thin Film device applications with transparent amorphous SiInZnO semiconductors		
Functional photocatalytic films for green buildings: from fundamental science to engineering		
Graphene transparent conductive film; progress, challenges and progress		
Hydrogen and stability in oxide semiconductors		
The Global Materials Network for Young Researchers		
Embedded metal mesh as transparent conductors and its application for touch panels		
Fighting Youth Unemployment using MOOCs		

Please provide a summary of how you have implemented what you learned from the ELBYSIER Intensive Programme

Long-answer text

Please feel free to add any additional comments below

Long-answer text

Thank you for filling in the survey.