



esipap

European School of Instrumentation
in Particle & Astroparticle Physics
since 2014



Lecturers, lab tutors & organizers

LAPP Annecy : M Delmastro, L Di Ciaccio, R Gouaty

ESI Archamps : M Gauthier, H Hoffmann, R Holland, Y Lemoigne, S Vandergooten

LBNL Berkeley : E Anderssen

CERN : P Bonnal, F Boyer, M Centis Vignali, D Dannheim, R Guida, C Holmkvist, J Kroeger, B Mandelli, I Mateu, M Moll, M Munker, A Pace, W Pokorski, S Ponce, A Ribon, H Sakulin, E Sicking, H Ten Kate, G Unal, T Vanat, H Vincke

ILL Grenoble : U Köster

Institut Néel Grenoble : M Calvo, F Lévy-Bertrand, A Monfardini

LPSC Grenoble : C Biscarat, J Collot, L Ferraris-Bouchez, J-Y Hostachy, J Macias-Perez, E Merle, F Montanet, J Odier, G Pignol, M. Yamouni

TIMA Grenoble : D Dzahini

U of London : F Pastore

CPPM Marseille : Y Coadou, C Morel

Ariane Group Paris : I Rongier

CNES Paris : Y Droz

LLR Palaiseau : C Ochando

Sapienza U & INFN Roma : E Pasqualucci

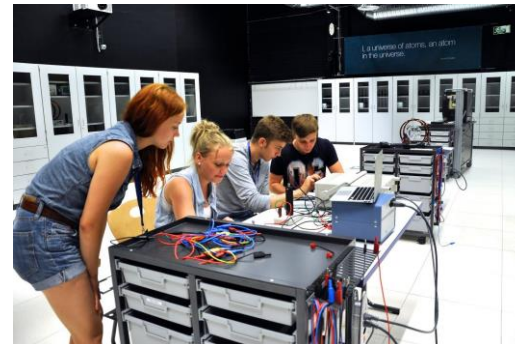
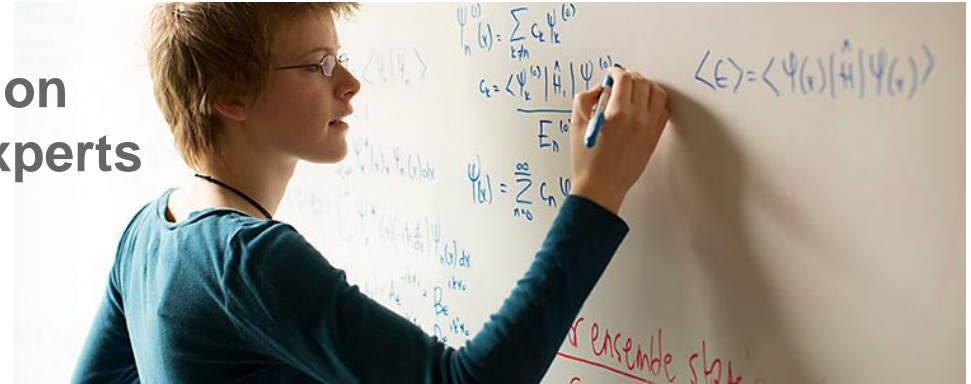
IRFU CEA Saclay : L Chevalier

IPHC Strasbourg : J Baudot, J-M Brom, E Chabert, E Conte, M Krauth

Training / Teaching

While theoretical physics might be taught in any place worldwide

**Training/teaching in instrumentation
requires resources and leading experts
that are more easily found next to
world labs**



ESIPAP since 2014

One of the reference schools in HEP instrumentation, close to CERN.

Training of the next generation of young physicists who will carry out HL-LHC upgrades, major experimental projects in neutrino physics, astroparticle physics, cosmology and later on new collider projects.

Very broad & intensive, with real exams : possibility of ECTS

2 courses of 4 weeks each, that can be followed entirely or selectively by weeks

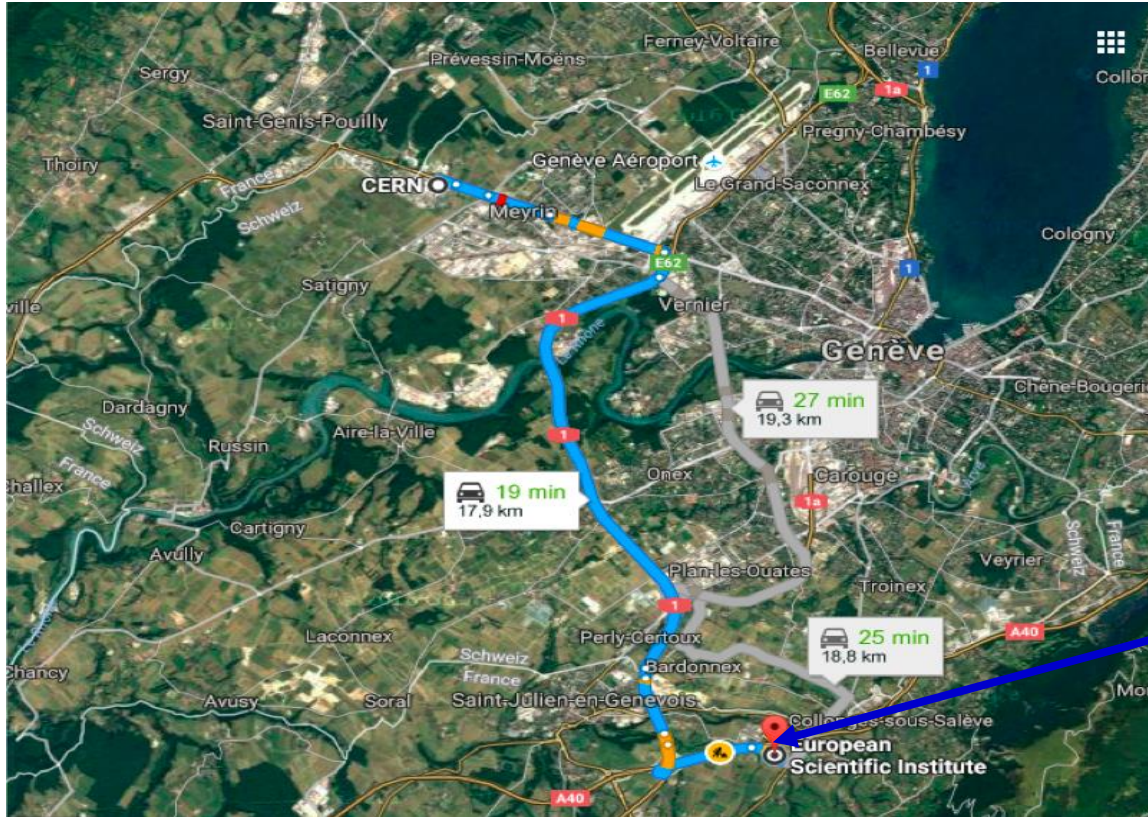
Selective international admission : 16 students for each course

Open to Master, PhD students and junior professionals

Reduced fees for students - Cost mostly supported by partners

Intense learning - Many practical sessions - Melting pot & cultural experience

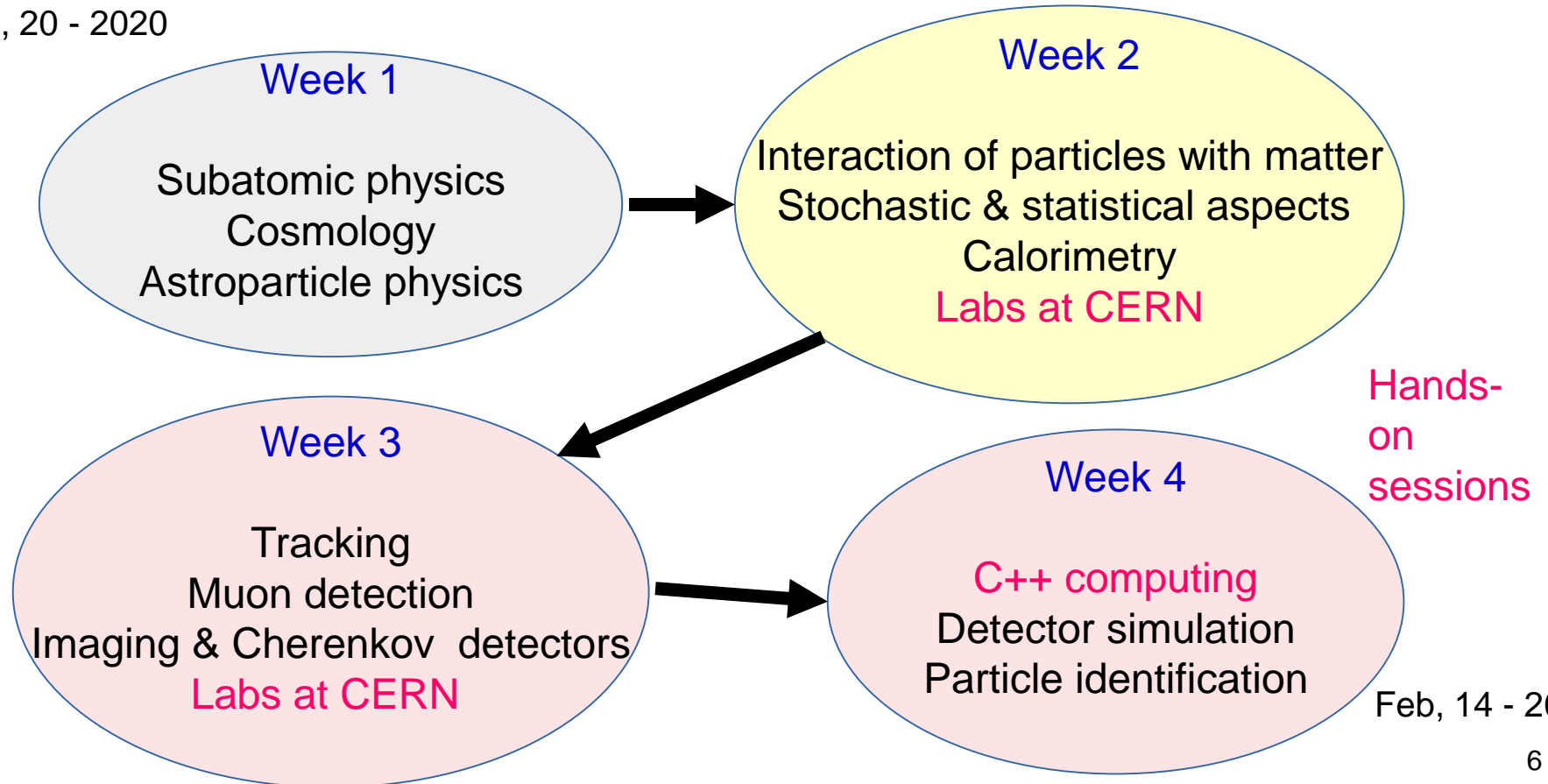
School location



Archamps Technopole

Course 1 : physics of particle and astroparticle detectors

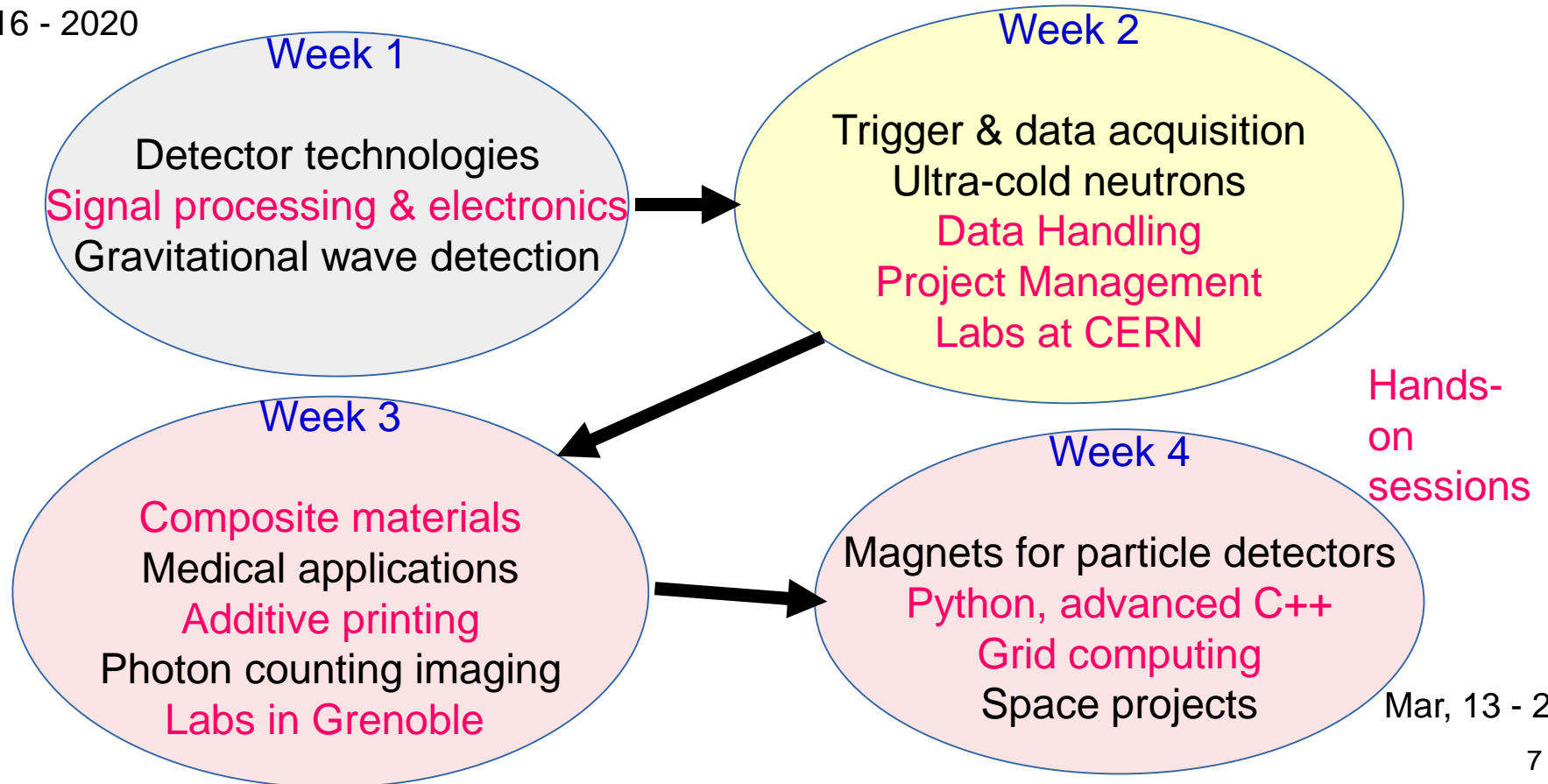
Jan, 20 - 2020



Feb, 14 - 2020

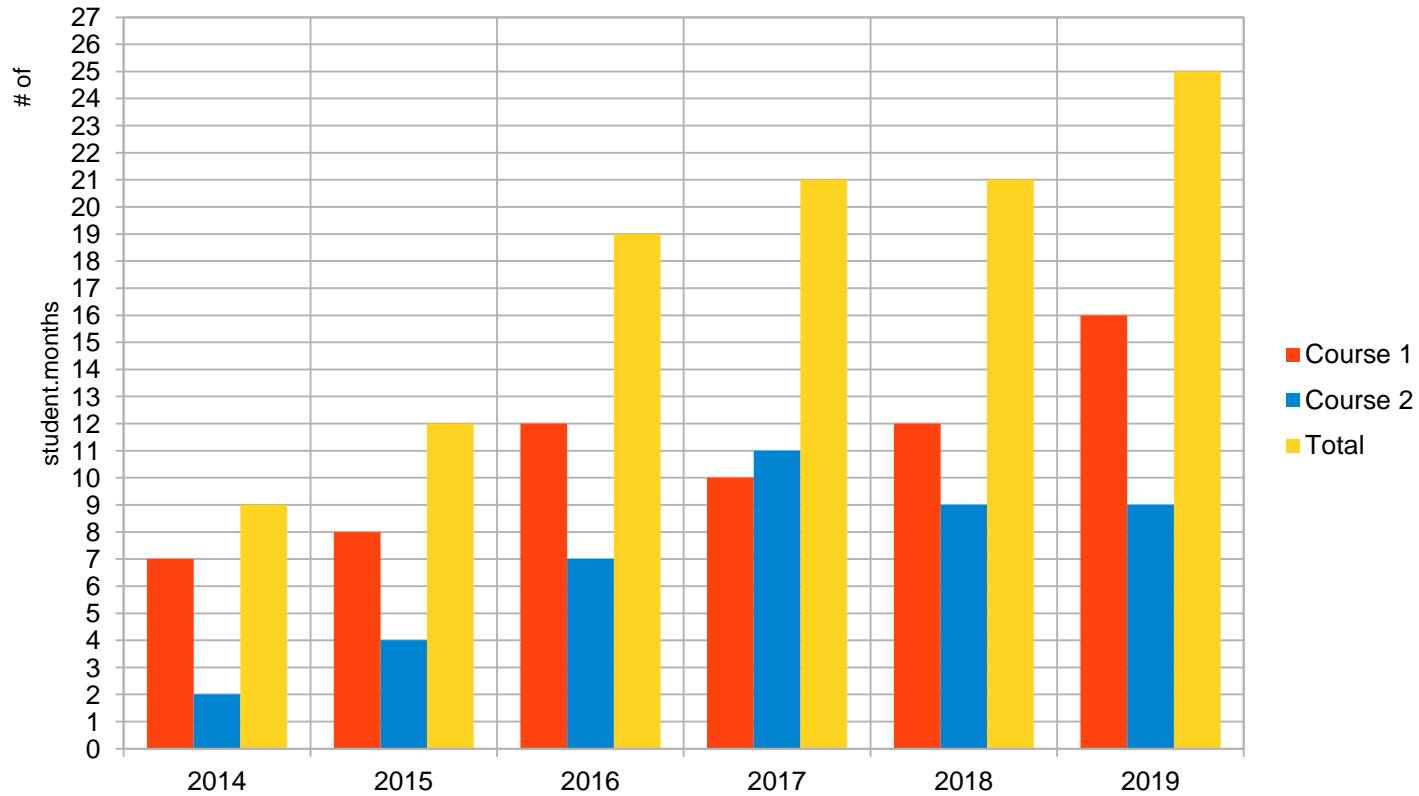
Course 2 : detector technologies & applications

Feb, 16 - 2020



Mar, 13 - 2020

Student attendance



Student Origin



Home countries (33 in total)
of ESIPAP alumni (84 till now)



Student diversity

84 alumni from 33 countries, 17 with limited access to HEP experimental facilities

32 % women, 68 % men

46 MS students, 36 PhD students, 1 pro , 1 BS student

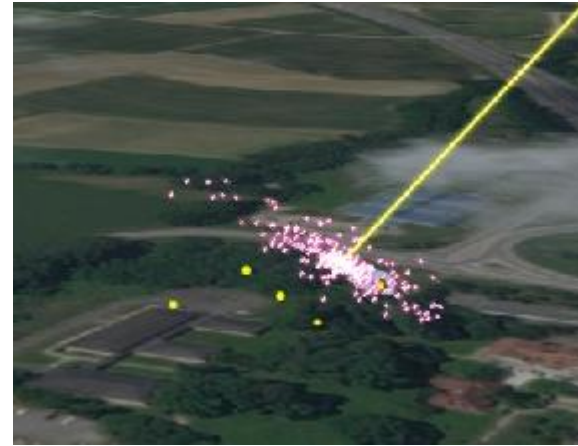
Europe : 54 - Asia : 17 - Africa : 10 - America : 3



AHEAD

(Archamps high-energy array detector)

- UHE neutrino air shower detector prototype decommissioned by helicopter and moved to ESI in Archamps
- Set of 5 cosmic stations
- Used as a lab setup





A. Pingault PhD student in Gent

Testimony

I was one of the lucky few that participated in the first ESIPAP edition in 2014. I included both modules as part of my master's degree in nuclear engineering from Grenoble-INP PHELMA. At that time I was already aiming to work in detector instrumentation but still unsure whether in the industry or the academy. Being surrounded by experts in their respective field for these two months helped me make my choice. **Shortly after finishing the school I got accepted for a PhD position in detector R&D for particle physics.**

The first module provided me with the background necessary to start working in my field. During the second module, I was able to discover and discuss technology and techniques I didn't even hear about before. Some of them I would use in my work afterwards. For this, lab sessions (all at CERN this year) were a major opportunity to get hands-on experience on state of the art technology.

The schedule of the school is dense! But, from our fellow international students to the quality of the teaching materials and interesting topics, the environment we are studying in makes it worthwhile. Lecturers are all experts in their respective field. Being able to interact directly with them in such conditions is a rare opportunity.

All in all, it was a superb first work experience in such international context. I would gladly urge anyone interested in detector instrumentation to attend the ESIPAP school.

Testimony

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"Joining the intensive ESIPAP school is a great way to learn about most relevant topics related to detectors for particle and astroparticle physics while making international friends and broadening your network.."

SILKE, 25, GERMAN
Master student in Particle Physics
at the University of Göttingen



Testimony

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« For me, ESIPAP is one from the best schools in the world in particle detectors : 8 weeks of intensive lectures which contain physics, engineering and programming. It was very useful for me, I survived with a huge amount of experience and information about particle & astroparticle detectors. »

MAHMOUD, 21, EGYPTIAN,
Master student at the University of
Alexandria



Testimony



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« ESIPAP was a great opportunity to improve my professional skills. There you can meet people working in the particle detection field coming from several countries, academic levels and knowledge branches. This mixture makes ESIPAP a wonderful place for sharing experiences, learning from the best lecturers and practicing with computer sessions and labs supported by the most important institutes in particles physics like CERN and LPSC. This school drew a beautiful line in life. »

JESUS RODRIGUEZ, 22, COLOMBIAN
PhD student, School of Physics of
Bucaramanga

Testimony



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« The modules are a perfect blend of theoretical and experimental aspects of detector technologies. Practical sessions of offline computing and labs at CERN were all fun. Here you get the opportunity to interact with experts and scientists that shapes your approach towards science and make you think out of the box. Attending ESIPAP was an opportunity to build a connection with international students and creating lifetime memories with awesome people. Thanks ESI for the opportunity! »

DIVYA SAINI, 24, INDIAN
Master student, MNIT Jaipur

ESIPAP in pictures



ESIPAP in pictures



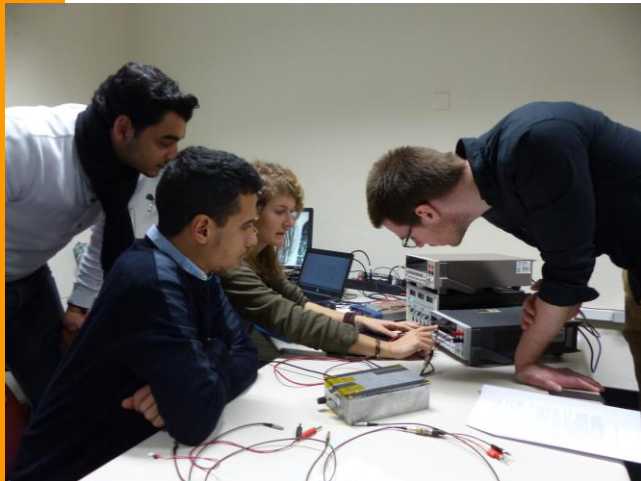
ESIPAP in pictures



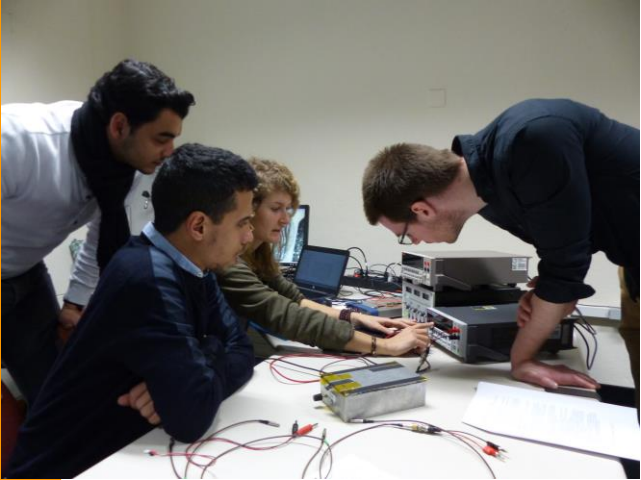
ESIPAP in pictures



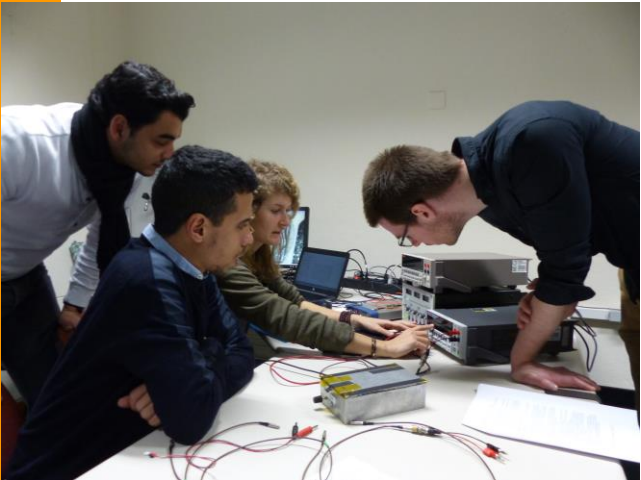
ESIPAP in pictures



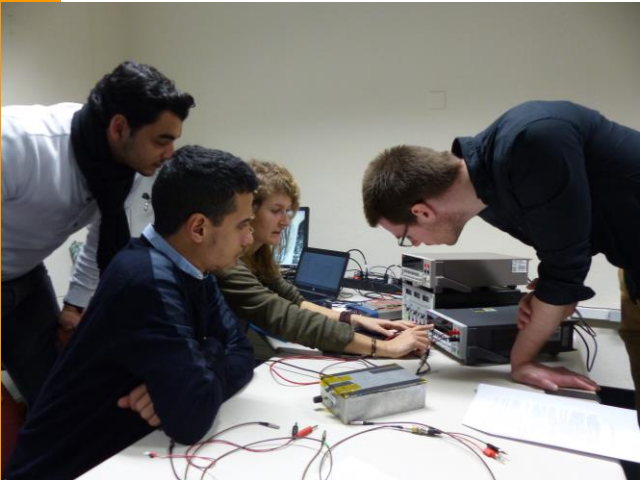
ESIPAP in pictures



ESIPAP in pictures



ESIPAP in pictures



ESIPAP by the numbers

- 2 independent courses of 4 weeks each
- student capacity (for 2020) : 20 for course 1 , 16 for course 2
- lectures : 27
- lecturers : 34
- lecture hours : 174 h over 8 weeks
- lab tutors : 17
- labs : 1 @ ESI (AHEAD), 5 @ CERN , 2 in Grenoble, 4 computing labs (25 hours in total)
- exams : 11 + 4 lab reports
- overall budget : 80 k€ (1/2 from [ENIGMASS](#) , 1/8 from registration fees, 1/4 from local authorities, 1/8 from ESI)

Conclusion & prospects

- 6 years of experience & growing success
- 84 alumni from 33 countries all highly satisfied
- great adhesion of lecturers and tutors
- cultural melting pot

- budget model secured for another 5 years
- ramp up progressively the student capacity (20 course 1 , 16 course 2)
- room for options : medical , ultra-high precision physics, gravitational wave astronomy ...
- PhD position portal in instrumentation

Further information

Introductory video : <https://youtu.be/f2ggf4P36cc>

Contact : esipap@esi-archamps.eu

Next session : course 1 , 20 Jan. - 15 Feb. 2020
course 2 , 18 Feb. - 13 Mar. 2020

Registration : www.esipap.eu , starts 2 September 2019.

Twitter : @ESIArchamps

LinkedIn : @ESI Archamps

Facebook : www.facebook.com/ESIArchamps



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Backup

Schedule 2019	Monday Jan 21st	Tuesday Jan 22nd	Wednesday Jan 23rd	Thursday Jan 24th	Friday Jan 25th
09:00	Arrival	Experimental Cosmology lecture 1 Juan Macias Perez <i>LPSC Grenoble</i>	Experimental Subatomic Physics lecture 1 Marco Delmastro <i>LAPP Anecy</i>	Experimental Subatomic Physics lecture 3 Marco Delmastro <i>LAPP Anecy</i>	Experimental Subatomic Physics lecture 5 Marco Delmastro <i>LAPP Anecy</i>
10:30		Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:45		Experimental Cosmology lecture 2	Experimental Subatomic Physics lecture 2	Experimental Subatomic Physics tutorial 1	Experimental Subatomic Physics tutorial 3
12:00	12:00 OFFICIAL OPENING (welcome & building visit)	Juan Macias Perez <i>LPSC Grenoble</i>	Marco Delmastro <i>LAPP Anecy</i>	Marco Delmastro <i>LAPP Anecy</i>	Marco Delmastro <i>LAPP Anecy</i>
12:15	13:00 WELCOME LUNCH	BREAK	BREAK	BREAK	BREAK
14:00	14:30 Presentation of ESIPAP & Presentation of students Johann Collot ESIPAP Director	Experimental Cosmology lecture 3 Juan Macias Perez <i>LPSC Grenoble</i>	Experimental Cosmology tutorial 2 Juan Macias Perez <i>LPSC Grenoble</i>	Experimental Subatomic Physics lecture 4 Marco Delmastro <i>LAPP Anecy</i>	Experimental Subatomic Physics tutorial 4 Marco Delmastro <i>LAPP Anecy</i>
15:30	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
15:45	16:00 - 17:30 HL-LHC program & upgrade Didier Contardo <i>IPNL Lyon</i>	Experimental Cosmology tutorial 1 Juan Macias Perez <i>LPSC Grenoble</i>	Experimental Cosmology tutorial 3 Juan Macias Perez <i>LPSC Grenoble</i>	Experimental Subatomic Physics tutorial 2 Marco Delmastro <i>LAPP Anecy</i>	Experimental Subatomic Physics tutorial 5 Marco Delmastro <i>LAPP Anecy</i>
17:15	CHECK-IN AT THE RESIDENCE & SHOPPING FOR GROCERIES	Free-Electron Lasers JUAS Seminar <i>E. Prat</i>		LHC & Future High-Energy Circular Collider JUAS Seminar <i>O. Bruning</i>	
18:15				AFTER WORK AT ESI	

ESIPAP TIMETABLE 2019 WEEK 2

Schedule 2019	Monday Jan 28th	Tuesday Jan 29th	Wednesday Jan 30th	Thursday Jan 31st	Friday Feb 1st	Saturday Feb 2nd
09:00	Experimental Astroparticle Physics lecture 1 François Montanet LPSC Grenoble	Interaction of Particles with Matter lecture 1 Lucia di Ciaccio LAPP Annecy	Tracking : lecture 1 Jérôme Baudot IPHC Strasbourg	<i>Bus leaves at 7:00 from ESIPAP</i> (Lunch at CERN) Lab Training Sessions at CERN <i>Return scheduled at 18:00</i>	Radioprotection Helmut Vincke CERN	9:30 - 11:00 Exam EAP + EC
10:30	Coffee Break	Coffee Break	Coffee Break		Coffee Break	Coffee Break
10:45	Experimental Astroparticle Physics lecture 2 François Montanet LPSC Grenoble	Interaction of Particles with Matter tutorial 1 Lucia di Ciaccio LAPP Annecy	Tracking : lecture 2 Jérôme Baudot IPHC Strasbourg		Radioprotection Helmut Vincke CERN	11:30 - 13:00 Exam ESP
12:15	WORKING LUNCH	BREAK	BREAK		BREAK	
14:00	Experimental Astroparticle Physics lecture 3 François Montanet LPSC Grenoble	Interaction of Particles with Matter lecture 2 Lucia di Ciaccio LAPP Annecy	Tracking : lecture 3 Jérôme Baudot IPHC Strasbourg		Stochastic & Statistical Aspects : part 1 lecture 1 Laura Ferraris-Bouchez LPSC Grenoble	
15:30	Coffee Break	Coffee Break	Coffee Break		Coffee Break	
15:45	Experimental Astroparticle Physics tutorial 1 François Montanet LPSC Grenoble	Interaction of Particles with Matter tutorial 2 Lucia di Ciaccio LAPP Annecy	Tracking : tutorial Jérôme Baudot IPHC Strasbourg		Stochastic & Statistical Aspects : part 1 lecture 2 Laura Ferraris-Bouchez LPSC Grenoble	
17:15			Novel High Gradient Particle Accelerators JUAS Seminar R. Assmann			
18:15			AFTER WORK AT ESI			

ESIPAP TIMETABLE 2019 WEEK 3

Schedule 2019	Monday Feb 4th	Tuesday Feb 5th	Wednesday Feb 6th	Thursday Feb 7th	Friday Feb 8th
09:00	Calorimetry : lecture 1 Christophe Ochando CNRS	Calorimetry : lecture 3 Christophe Ochando CNRS	Muon Detection lecture 1 Laurent Chevalier CEA-IRFU Saclay	<p><i>Bus leaves at 7:00 from ESIPAP</i></p> <p><i>(Lunch at CERN)</i></p> <p>Lab Training Sessions at CERN</p> <p><i>Return scheduled at 18:00</i></p>	Muon Detection lecture 3 Laurent Chevalier CEA-IRFU Saclay
10:30	Coffee Break	Coffee Break	Coffee Break		Coffee Break
10:45	Machine learning lecture 1 Yann Coadou CPPM Marseille	Decision trees lecture 3 Yann Coadou CPPM Marseille	Muon Detection lecture 2 Laurent Chevalier CEA-IRFU Saclay		Muon Detection tutorial Laurent Chevalier CEA-IRFU Saclay
12:15	WORKING LUNCH	BREAK	BREAK		BREAK
14:00	Machine learning lecture 2 Yann Coadou CPPM Marseille	Decision trees lecture 4 Yann Coadou CPPM Marseille	Imaging and Cherenkov Detectors : lecture 1 François Montanet LPSC Grenoble		Imaging and Cherenkov Detectors : lecture 3 François Montanet LPSC Grenoble
15:30	Coffee Break	Coffee Break	Coffee Break		Coffee Break
15:45	Calorimetry : lecture 2 Christophe Ochando CNRS	Calorimetry : lecture 4 Christophe Ochando CNRS	Imaging and Cherenkov Detectors : lecture 2 François Montanet LPSC Grenoble		Exam IPM
17:15					

ESIPAP TIMETABLE 2019 WEEK 4

Schedule 2019	Monday Feb 11th	Tuesday Feb 12th	Wednesday Feb 13th	Thursday Feb 14th	Friday Feb 15th	Saturday Feb 16th
09:00	Detector Simulation Alberto Ribon <i>CERN</i>	Detector Simulation Alberto Ribon <i>CERN</i>	Computing sessions Eric Chabert <i>IPHC Strasbourg</i> Eric Conte <i>IUT de Colmar</i>	Computing sessions Eric Chabert <i>IPHC Strasbourg</i> Eric Conte <i>IUT de Colmar</i>	9:00 - 10:30 Exam Calorimetry	9:30 - 11:00 Exam Tracking
10:30	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:45	Detector Simulation Alberto Ribon <i>CERN</i>	Detector Simulation Alberto Ribon <i>CERN</i>	Computing sessions Eric Chabert <i>IPHC Strasbourg</i> Eric Conte <i>IUT de Colmar</i>	Computing sessions Eric Chabert <i>IPHC Strasbourg</i> Eric Conte <i>IUT de Colmar</i>	Particle Identification Guillaume Unal <i>CERN</i>	11:30 - 13:00 Exam Muon
12:15	WORKING LUNCH	BREAK	BREAK	BREAK	BREAK	
14:00	C++ Programming Eric Chabert <i>IPHC Strasbourg</i>	C++ Programming Eric Chabert <i>IPHC Strasbourg</i>	Computing sessions Eric Chabert <i>IPHC Strasbourg</i> Eric Conte <i>IUT de Colmar</i>	Computing sessions Eric Chabert <i>IPHC Strasbourg</i> Eric Conte <i>IUT de Colmar</i>	Particle Identification Guillaume Unal <i>CERN</i>	
15:30	Coffee Break	Coffee Break	Coffee Break	Coffee Break		
15:45	C++ Programming Eric Chabert <i>IPHC Strasbourg</i>	C++ Programming Eric Chabert <i>IPHC Strasbourg</i>	Computing sessions Eric Chabert <i>IPHC Strasbourg</i> Eric Conte <i>IUT de Colmar</i>	Computing sessions Eric Chabert <i>IPHC Strasbourg</i> Eric Conte <i>IUT de Colmar</i>		
17:15	C++ Programming Eric Chabert <i>IPHC Strasbourg</i>	Particle accelerators, instruments of discovery in physics JUAS Seminar <i>P. Lebrun</i>	Computing sessions Eric Chabert <i>IPHC Strasbourg</i> Eric Conte <i>IUT de Colmar</i>			
18:45			AFTER WORK AT ESI			

ESIPAP TIMETABLE 2019 WEEK 5

Detector Technologies & Electronics

Schedule 2019	Monday Feb 18th	Tuesday Feb 19th	Wednesday Feb 20th	Thursday Feb 21st	Friday Feb 22nd
09:00	Arrival	Signal Processing and Electronics Daniel Dzahini	Low Temperature Detectors Martino Calvo	Signal Processing and Electronics Daniel Dzahini	Signal Processing and Electronics Daniel Dzahini
10:30		Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:45		Signal Processing and Electronics Daniel Dzahini	Detector Technologies Jean-Marie Brom <i>IPHC Strasbourg</i>	Signal Processing and Electronics Daniel Dzahini	Detector Technologies noble liquid detectors Johann Collot <i>LPSC Grenoble</i>
12:15		12:00 OFFICIAL OPENING (welcome & building visit)	BREAK	BREAK	BREAK
14:00	13:00 WELCOME LUNCH	Detector Technologies Jean-Marie Brom <i>IPHC Strasbourg</i>	Signal Processing and Electronics Daniel Dzahini	Detector Technologies Jean-Marie Brom <i>IPHC Strasbourg</i>	Detector Technologies tutorials Johann Collot <i>LPSC Grenoble</i>
15:30	14:30 Presentation of ESIPAP & Presentation of students	Detector Technologies Jean-Marie Brom <i>IPHC Strasbourg</i>	Signal Processing and Electronics Daniel Dzahini	Detector Technologies Jean-Marie Brom <i>IPHC Strasbourg</i>	Detector Technologies tutorials Johann Collot <i>LPSC Grenoble</i>
15:45	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
17:15	Reminder on Particle Interaction with Matter Johann Collot <i>LPSC Grenoble</i>	Detector Technologies Jean-Marie Brom <i>IPHC Strasbourg</i>	Signal Processing and Electronics Daniel Dzahini	Signal Processing and Electronics Daniel Dzahini	Gravitational wave detection Romain Gouaty <i>LAPP</i>
	CHECK-IN AT THE RESIDENCE & SHOPPING FOR GROCERIES		AFTER WORK AT ESI		

ESIPAP TIMETABLE 2019 WEEK 6

Real Time Computing & Data Handling

Schedule 2019	Monday Feb 25th	Tuesday Feb 26th	Wednesday Feb 27th	Thursday Feb 28th	Friday March 1st
09:00	Ultra Cold Neutrons Guillaume Pignol <i>LPSC Grenoble</i>	Ultra Cold Neutrons Guillaume Pignol <i>LPSC Grenoble</i>	Practical on cosmic muon detection François Montanet	<i>Bus leaves at 7:00 from ESIPAP</i> (Lunch at CERN) Lab Training Sessions at CERN <i>Return scheduled at 18:00</i>	Data Handling Technologies Alberto Pace <i>CERN</i>
10:30	Coffee Break	Coffee Break	Coffee Break		Coffee Break
10:45	Ultra Cold Neutrons Guillaume Pignol <i>LPSC Grenoble</i>	Ultra Cold Neutrons Guillaume Pignol <i>LPSC Grenoble</i>	Practical on cosmic muon detection François Montanet		Data Handling Technologies Alberto Pace <i>CERN</i>
12:15	WORKING LUNCH	BREAK	BREAK		BREAK
14:00	Exam : SPE	Trigger Francesca Pastore <i>University of London</i>	Data Handling Technologies Alberto Pace <i>CERN</i>		Project Management Pierre Bonnal <i>CERN</i>
15:30	Coffee Break	Coffee Break	Coffee Break		Coffee Break
15:45	Exam : DT	Trigger and Data Acquisition Software Enrico Pasqualucci <i>INFN</i>	Data Handling Technologies Alberto Pace <i>CERN</i>		Project Management Pierre Bonnal <i>CERN</i>
17:15		FPGA Hannes Sakulin <i>CERN</i>	Building Large Accelerators JUAS Seminar Philippe Lebrun		
			AFTER WORK AT ESI		

ESIPAP TIMETABLE 2019 WEEK 7 Mechanics & Medical Applications

Schedule 2019	Monday March 4th	Tuesday March 5th	Wednesday March 6th	Thursday March 7th	Friday March 8th
09:00	Composite Materials for Particle Detectors Éric Anderssen <i>LBNL</i>	Medical Applications Ziad El-Bitar <i>IPHC Strasbourg</i>	Photon Counting Imaging Christian Morel	<i>Bus leaves at 7:00 from ESIPAP</i> (Lunch at LPSC) Lab Training Sessions in Grenoble (Night in Grenoble)	Medical Radioisotopes Ulli Koester <i>ILL Grenoble</i> (Lunch at LPSC) Lab Training Sessions in Grenoble <i>Return scheduled at 19:00</i>
10:30	Coffee Break	Coffee Break	Coffee Break		
10:45	Composite Materials for Particle Detectors Éric Anderssen <i>LBNL</i>	Medical Applications Ziad El-Bitar <i>IPHC Strasbourg</i>	Exam : UCN		
12:15	WORKING LUNCH	BREAK	BREAK		
14:00	Medical Applications Ziad El-Bitar <i>IPHC Strasbourg</i>	Additive Printing Marc Krauth <i>IPHC Strasbourg</i>	Project Management Pierre Bonnal <i>CERN</i>		
15:30	Coffee Break	Coffee Break	Coffee Break		
15:45	Medical Applications Ziad El-Bitar <i>IPHC Strasbourg</i>	Additive Printing Projet Marc Krauth <i>IPHC Strasbourg</i>	Project Management Pierre Bonnal <i>CERN</i>		
17:15					
					AFTER WORK AT ESI

ESIPAP TIMETABLE 2019 WEEK 8 : Offline Computing

Schedule 2019	Monday March 11th	Tuesday March 12th	Wednesday March 13th	Thursday March 14th	Friday March 15th
09:00	Exam : MA	C++ Programming Sébastien Ponce <i>CERN</i>	C++ Programming Sébastien Ponce <i>CERN</i>	C++ Programming Sébastien Ponce <i>CERN</i>	10:00 - 13:00 The Ariane Odyssey, from Ariane 1 to Ariane 6 (part 1)
10:30	Coffee Break	Coffee Break	Coffee Break	Coffee Break	
10:45	Magnets for Particle Detectors Herman Ten Kate <i>CERN</i>	C++ Programming Sébastien Ponce <i>CERN</i>	C++ Programming Sébastien Ponce <i>CERN</i>	C++ Programming Sébastien Ponce <i>CERN</i>	Isabelle Rongier <i>ASL</i> & Jan Droz <i>CNES</i>
12:15	WORKING LUNCH	BREAK	BREAK	CLOSING JUAS LUNCH OFFERED BY ESI	13:00 LUNCH OFFERED BY ESI
14:00	Magnets for Particle Detectors Herman Ten Kate <i>CERN</i>	Python Programming Jérôme Odier <i>CNRS</i>	Grid Computing Catherine Biscarat <i>LPSC Grenoble</i>		14:00 - 15:30 The Ariane Odyssey, from Ariane 1 to Ariane 6 (part 2)
15:30	Coffee Break	Coffee Break	Coffee Break	Coffee Break	
15:45	Magnets for Particle Detectors Herman Ten Kate <i>CERN</i>	Python Programming Jérôme Odier <i>CNRS</i>	Grid Computing Catherine Biscarat <i>LPSC Grenoble</i>	Exam : MPD	END OF ESIPAP 2019
17:15					