

Doctorate School Astronomie & Astrophysique d'Ile de France

Doctorate Training 2014-2015

<http://ecole-doctorale.obspm.fr/rubrique107.html>

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Goals of the doctoral training

The main goal of the doctoral courses at Doctoral School 127 (Astronomie et Astrophysique en Ile de France, later ED 127) is to provide the PhD students with a complementary training leading to new scientific themes, methods or know-how, or simply in-depth studies of several known concepts in the field of their thesis or in different fields.

The objective is also to promote the PhD thesis as a genuine professional experience in order to support access to employment after the defense, whether within or outside the framework of academic research. This is done through information and reflection about all potential professional horizons.

Principle of the doctoral training

Content of the training

The doctoral training at ED 127 consists of 120 hours divided as follows :

- **Participation to at least one thematic winter/spring/summer/fall school (30h)**, on a topic close, or not, to the PhD subject. The school should specifically be dedicated to PhD students, postdocs or researcher. Its minimal duration is one week. The participation to a school can not be replaced by the participation to a workshop or a conference. The equivalence to 30 hours of formation is obtained after the approval by the doctoral training manager (approval should be asked before the participation to the school by e-mail, with a link toward the program of the school). A financial help can be provided by the Doctorate School. It is asked directly to the Doctorate School Director after approval by the training manager. The form is available at :

<http://ecole-doctorale.obspm.fr/Financement-par-l-ED-de-formationen>).

- **90 hours of training** as following :

- participation to long courses of 30h (1 week module) and to short courses of 15h (2 and 1/2 day modules), proposed by ED 127 (please find at the end of the document, the list of modules proposed in 2014 - 2015),
- participation to courses proposed by other doctoral schools, : In that case, the temporal equivalence has to be discussed directly with the formation training manager before the participation to the course.
- participation to courses proposed by the Collège de France : an agreement has been signed between the Collège de France and ED 127 to validate these courses in the doctoral training program. The list of courses is available at <http://www.college-de-france.fr/site/enseignement/index.htm>
- participation to the "Doctoriales" organised by universities.

Whatever the training path, it must be approved by the doctoral training manager.

Doctoral training organization

The complete doctoral training cursus should be completed at the end of the second year of PhD (with a potential exception for the thematic schools) so that the third year of PhD can be devoted to the manuscript and papers writing. Each student should thus follow an amount of 60 hours per year (e.g : one long module (30h) and two short ones (2x15h)).

The registration to doctoral training course during the third year of PhD should first be validated by the doctoral training manager after discussion with the PhD advisor.

Doctoral training validation

The doctoral training is **mandatory to allow the PhD defense**, as the manuscript writing. It should thus be integrated as it in the working program of each PhD student. In case of difficulties with the PhD advisor, please contact as soon as possible the doctoral training manager.

The management of the doctoral training program of each student registered at the ED 127 is done by the secretary (Annie Mercier). All the modules proposed by the Doctorate school are validated directly by the training course manager, assuming the courses have been followed completely. The effective attendance to a course is validated by the student signature during the course.

At the end of the Doctoral training, each student receive a single attestation with the detailed list of courses during the PhD. This attestation is necessary for the PhD defense registration. If a student follows a course which is not organised by the Doctorate school, she/he must first ask for an equivalence to the training program manager before the course, and then satisfy the validation rules edicted by the course organizer. In that case, The student should ask for a participation attestation, and give it to the Doctoral training office to be effectively validated. ECTS can be given upon request.

Particular cases

- **PhD Thesis in a foreign country:** The Doctorate training is still mandatory but can be adapted with courses followed either in France or in a foreign university. In any case, the program should be built with the training manager and the PhD advisor. Contacts should be taken early at the PhD beginning.

- **Teaching activities:** Several teaching activities (monitorat, tutorat) can lead to equivalences, particularly if they imply specific courses for teachers. Please contact the Doctoral training manager for the definition of equivalences.

Important : The participation to teaching activities does not prevent from following the entire doctoral training modules. Check before you register you are able to follow the entire modules.

- **free auditors :** Every PhD student from another doctorate school is allowed to follow the course proposed by ED 127, if seats are available. ECTS can be given upon request.

Registration procedure

The registration to the Doctoral training courses is done in october thanks to the web interface :

https://ufe.obspm.fr/ed_choix_enseignements/inscription

The administrative management is done by **Annie Mercier who should be in carbon copy of each message exchange with the doctoral training manager.**

Modules proposed in 2014-2015

Types of modules

- **”Modules d’ouverture” (MO)** : 30h in one week, from mid of december to mid of March. They are an initiation or a short course on specific topics or methods. They can be mentioned on a CV as a training session. They are given in a laboratory and concluded by a report or an oral presentation.

- **Modules d’approfondissement (MA)**, 15h usually in 2 and 1/2 days from february to mid of april. As a complement of the master, theses modules deal with specific topics of astrophysics or connected fields.

Program 2014-2015

Modules d’ouverture

- **“ Data analysis : methods and applications”**, 15 - 19 December 2014, IAS, Orsay.

Modern data analysis methods are presented under the form of courses and training sessions associated to known and used softwares. Several topics are considered during the week:

- Temporal series analysis, Fourier transform, wavelets transform (F. Auchère, F. Baudin),
- Component separation analysis (J. Bobin).
- Astrophysical data parcimonial representation : from wavelets to compressed sensing (F. Sureau),
- automatic classification in astrophysics (E. Bertin)
- inversion technics and applications (M.-J. Goupil, R. Samadi),

- **“ The Bayesian statistical approach through examples”**, 5 - 9 January 2015 à l’IAP.

This module presents the basic principles of bayesian statistivcal analysis, and illustrates them through personnal examples. Because of the interactivity of this modules, you can illustrate the courses during the practical sessions using your own analysis problems.

- **“ Numerical simulations and High performance computation ”**, 12 - 16 January 2015, la Maison de la Simulation (CEA of Saclay campus).

This module is an initiation to numerical simulations : N-body methods and hydrofynamics, massive parallel computation (introduction to MPI and GPU). This module

is conducted with the help of engineers from IDRIS (CNRS) and researchers from CEA, CNRS, and Université Paris XI. This module is made of courses, and practical work on supercomputers to illustrate the courses.

- “ **Fluid and kinetic descriptions of plasmas** ”, 12 - 16 January 2015, CIAS, Château de l’Obs de Meudon.

Plasma phenomena can be described depending on conditions, by kinetic or fluid physical models. The courses deals with this description duality, starting from several numerical experiences, on two types of codes. and the generalization of these problems to astrophysics. The knowledge of numerical simulation is not mandatory. Thanks to exchanges between participants and the teaching team, the level can be adapted to the diversity of participants.

more information on : <http://www.lpp.fr/Description-fluide-et-cinetique>

- “ **Préparer l’après-thèse : s’insérer dans les métiers et carrières après la thèse dans ou hors recherche publique**, 2 - 6 March 2015, IAS Orsay. (In french)

During this module, we present the complete set of carriers at the end of the PhD, either in the academic and industrial world, and the different ways to reach them. This module also aims at given to student the opportunity to probe their personal wish and competences. This module is made of short presentations (working in CNRS, CNAP, University, space agencies, in a non academic company...) and practical work : preparing an application, writing a CV, a motivation letter, a interview... Because of its specificity, this module is only given in French.

Modules d’approfondissement

- “ **Large Surveys and cosmostatistics** ”, (GB) Prof. B. Wandelt (IAP/UPMC), 6 sessions, 2, 6, 9 February 2015 from 14:00 to 16:30 and 4, 11 and 13 February 2015 from 9:30 to 12:00 at IAP.

- “ **Evolution of far galaxies : starburst / AGN** ”, B. Rocca-Volmerange (Paris XI/IAP) 11 (afternoon) to 13 March 2015 at IAP.

- “ **General relativity basics** ”, G. Esposito-Farèse (IAP) 16 - 20 March 2015, afternoon (14:00-17:30), at IAP

- “ **Simple solutions to impossible problems**”, (GB) Prof. B. Wandelt (IAP/UPMC), 23 - 25 (noon) March 2015 at IAP.

Courses built around specific examples of quantitative problems where classical technics don’t work and for which progress can be done by the use of non conventional technics. This courses is made of lessons and practical work on examples.

- “ **Initiation to virtual observatory** ” 25 (afternoon) - 27 March 2015 at

l'Observatoire de Paris.

This module aims at discovering thanks to tutorials, several tools developed in the context of the virtual observatory, and associated to several astrophysical topics. (stellar physics, galactical study, planetology...)

- “ **Histoire des sciences : l’histoire de la cosmologie et des distances célestes** ” E. Nicolaidis (Obs de Paris) 30 March - 1 April (noon) 2015 at Observatoire de Paris. (In french)

Dans ce module nous allons présenter les systèmes cosmologiques de Platon à Edmond Halley, en mettant l’accent sur l’estimation des distances célestes.

Le problème des distances a préoccupé les astronomes dès les temps les plus anciens. Depuis Platon, il ne s’agissait pas seulement de comprendre quelle était la structure de l’univers mais aussi d’exprimer cette structure en termes mathématiques. Tout de suite donc, le problème des dimensions se posa. Quelles étaient les dimensions des sphères célestes sur lesquelles étaient sensés se mouvoir les planètes ? Dans un système planétaire fondé sur des cycles et des épicycles imaginé au 4^e s. av. J.C. et qui se perpétua jusqu’au 17^e s. de notre ère, les astronomes se sont efforcés non seulement de calculer les rapports des cercles planétaires mais aussi leurs dimensions absolues. Et dans ce monde clôturé par la sphère des étoiles fixes, il fallait aussi imaginer le rayon de cette dernière. Plus tard, il s’agissait de déterminer les dimensions des ellipses planétaires mais aussi les distances des étoiles. Souvent la détermination des distances était liée à la grandeur des corps célestes. Jusqu’au développement du télescope, on ne pouvait estimer par des mesures d’angle que les dimensions de la lune et du soleil, qui ont un diamètre apparent à l’il nu. Les autres distances étaient sujettes à des extrapolations et des théories de tout genre, comme d’ailleurs les dimensions des étoiles pendant toute la période étudiée. Le module comportera aussi une présentation de la reconstitution du ”mécanisme d’Anticythère”, le plus ancien planétarium et calculatrice de calendrier à engrenages connu (1^{er} s. av.J.C.)

- “ **Dynamics Magnetism and spectroscopy of stars**”, S. Brun, S. Mathis (CEA), D. Katz (Obs. de Paris) 8 - 10 (noon) April 2015 at IAS Orsay and Observatoire de Meudon