

Erasmus Report on Physics at Université Paul-Sabatier (UPS), Toulouse, France 2003 – 2004

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Preparing for your stay

Applying to UPS

The application form I was given asks you to state what modules you want to study. The options are supposedly found on the UPS website, however when I looked they were out of date. I ended up sorting this out after I arrived. If like me, you are a bachelors student, then you are pretty much given free-reign over module choice, I went for *Licence* (3rd year) modules only, although if you are more adventurous you may want to try courses from the *Maitrise* (4th Year). Talk to Dr. Smith about this.

Language courses are offered in the week before term starts. Request a place on the course as soon as possible since places are limited. Although it may not improve your French immensely, it is a great way to meet other ERASMUS students at UPS.

You may get a choice of accommodation. Try to choose either the *Cite de Ponsan Bellevue* or one of the *Tripodes* since all the others are far from campus. After that I would very much recommend going for whichever has the highest concentration of ERASMUS students, if the choice is still not made consider that the Tripodes have lighter and airier rooms, but Ponsan Bellevue is more conveniently located near the shops and is quieter. I very much wanted to try fending for myself in a French apartment, however renting a flat outside of university is very difficult and relatively costly at the moment due to an accommodation crisis.

What to bring

The French are highly bureaucratic. Although you may not need them all, I would advise bringing the following things,

- Passport
- Bristol Student Card
- Proof of English address (i.e. bank statement)
- Birth Certificate (long version, if in English a translation is not needed)
- E128 Form
- Lots (eight or more) of passport photos (four as photocopies may be okay)

Even though Toulouse is in the South of France, it can get just as cold as the UK and rains just as much in the Winter, so bring jumpers, an umbrella and sensible footwear. It is probably worthwhile to bring some trainers since most societies are sporting ones and a swimming costume is probably a good idea if you plan to visit the Mediterranean in the summer months or do water sports.

Bring at least enough Euros with you to get you to the University (ten should do), since I lost my debit card after forgetting my PIN. (Fortunately, I had another debit card in my luggage.)

None of the university provided accommodation have cooking facilities, meals are usually bought in the restaurants on campus. However some basic cutlery such as knife, spoon, bowl, glass etc. can be useful for nibbles.

I brought my English textbooks in case I could not understand the French lessons. These came in very useful although they took up a huge proportion of luggage allowance.

If you have a laptop computer you may find it useful to bring that. Although no courses I took demanded word-processed reports, I did find it handy for working on a Matlab project and also being able to use a modern web-browser rather than the ancient version of Netscape available on most of the campus public access computers.

Bringing lots of electrical things is probably not a great idea since most rooms only have two electrical sockets and one of them is for shaving by the sink. Also multi-adapters are theoretically forbidden, however you soon discover that French rule making is rivalled only by French rule breaking.

Other things to organise

You will need possessions insurance, however before you take out a policy check that you are not already covered under your home insurance policy. I found that our policy covers you if you are not away for longer than three months at a time, since we return at Christmas and Easter it means I am covered. I would advise you check this with your underwriter first. Also, even if you are not covered and you don't mind risking the first few days without insurance, lots of French banks offer relatively cheap insurance as an extra with your account.

According to the International Students Office at UPS, medical insurance is not essential so long as you have your E128. The E128 will cover actual treatment whereas medical insurance will cover extra travel costs due to illness etc. but even that can be recouped from your LEA if it is excessive. I opted out of medical insurance. In any case there is a free medical centre (*SIMMPS*) for students in the top corner of campus next to Tripode C appointments are needed for non-emergencies.

Preparing for French Lectures

Lessons are *heavily* maths based. Even computer practicals were pretty much lessons in numerical maths methods. We used Dirac notation as well as operator notation extensively in quantum mechanics and maths, it is well worth looking into these beforehand just to get yourself familiar with the concepts.

Arriving in Toulouse

Timing Your Arrival

I would advise against arriving on the weekend as pretty much all services and shops are not available on Sunday, many are unavailable on Saturday. The *Restaurant Universitaire* (RU) only accepts meal tickets as payment at weekends, which of course can only be bought in the week. If you do find yourself in this fix, try the Esso garage on *Route de Narbonne*, it sells some foodstuffs and other provisions, alternatively you can try mooching for a ticket at the RU.

First impressions

Before you make friends, you may find the prospect of a year at UPS disheartening. It is very much unlike Bristol being a campus university and many creature comforts you may take for granted are hard to come by such as refrigerator space, cooking facilities, internet access and landline telephones (except payphones), also the

buildings are mostly in poor condition with rife graffiti and lots of building work going on at the campus and all the way into town (due to extension of Metro to UPS for completion in 2006). I also found the abundant acronyms confusing, (a throwback from the socialist state?) however all this becomes less of a problem as you settle in and start to adopt the rather radical French student mindset.



Some of the campus graffiti

Things to organise after arrival

Contrary to what you may have heard, the International Student Office asserts that a *Carte de Sejour* (ID card obtained from police) is not necessary for students provided we are not in the country for more than three months at a time. This no doubt saved us a lot of grief. However a *Carte de Sejour* may be necessary if you want to work in France, it depends on the employer.

You will need to enrol at the university to obtain your student card which can be done in a morning. So long as you have your documents, this should not be a problem.

Opening a French bank account is essential for claiming money from the *CAF* scheme (see below,) and also for avoiding costly exchange fees. To open an account you usually need your passport, proof of address (available from your hall secretary, allow 24hrs.) and your student card. Unfortunately the banks are not falling over themselves to get at your money as they are in the UK and you even have to pay small fees for the privilege. I opted for *Credit Lyonnais* who seem to be the French equivalent of Barclays. Don't be frustrated when you find that it takes up to a fortnight for your bank application to be processed.

It is possible to claim money back on accommodation costs from the *CAF* scheme (French housing benefits). You will need a French bank account for the to pay money into and the *Aide de Logement* form filled in by your hall secretary (they usually have a stack which have already been filled in). Take this, your banks details and proof of identity to the *CAF* office on *Rue de Riquet* in town. It is then just a case of filling in an online questionnaire and printing it out. It is actually refreshingly painless.

You will need 3rd party insurance in France in case you trip somebody up and they decide to sue. This is supplied by the *mutuels* and costs about 12€ a year. There are marquees outside the main reception selling this during the registration period, otherwise you need to go to one of the offices in town, also on *Rue de Riquet*.

Life at UPS

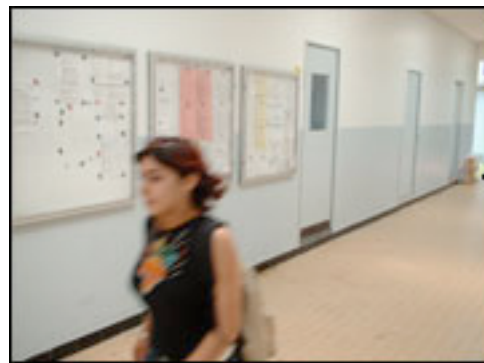
The People

I get the impression that more native English speaking ERASMUS students attend UPS than INSA (which would make sense given that it is much larger.) Although this may be comforting (especially to begin with,) it may hinder the development of your French. Try to make some French friends as well! This is not as hard as it sounds as people, especially students, in Toulouse are generally fairly open and welcoming.

The people in the International Students Office are very friendly and helpful even if some of the others you meet around Physics (who are hugely overworked at the time of writing due to strikes,) are not.

The University

By the standards of UK universities, UPS is in poor condition. The buildings are covered with graffiti and fly-posters, many buildings look almost derelict with foundations showing. Also there is much construction work going on at the main entrance and outside the main residences due to the extension of the Metro. Some of the buildings are newer, (the *INSA* campus is relatively modern and free of the usual graffiti) however main physics laboratories are in need of maintenance.



University notice boards

Communication within the university is done via notice boards rather than email. As a result email access is not guaranteed and you may find yourself having to learn how to use `ssh` or use the Resnet webmail service. Communication by notice board can be frustrating, especially since there are so many room changes to begin with, you find yourself having to check daily, first thing, in order to find the right room.

The City

Toulouse is a nice city. In the centre, there are fountains in many of the *places* along with the distinct orange/pink stone buildings. The central town architecture resembles Georgian England for the most part with relatively few Bristol Student Union look-alikes. The extensive building work due to the Metro however does ruin the feel of the town a little bit and like many French cities and towns you have to watch your step for the ever-present dog dirt. Immediately outside of the city centre, you tend to find lots of large scale blocks of flats and high density housing, further out to the West of the river, expect to see more industry and large Ikea style shops, towards the East and South (around UPS), the housing tends to thin out into individual, quite Spanish looking, detached houses.

During the Winter months Toulouse tends to be a bit miserable, it rains a lot and people do not tend to go out much, however when the warm weather comes, it really livens up and becomes possibly one of the most vibrant and agreeable towns I have visited.

The main concentration of bars are around *Place St. Pierre*. There are others, but they require a good search around town. Bars stay open usually until 2AM and if you want to stay out later there are a few nightclubs scattered around the town centre but they tend to be small and expensive. Out in the suburbs there is *Dune* and the super-club *Aposia* which is huge if you can get there.

Theft is a problem in Toulouse. My car had petrol stolen from it on two occasions when it was parked outside the halls of residence. I also rarely leave my room unlocked. On the other hand, violent crime is almost unheard of. Walking around Toulouse at night is, in general, a fairly safe activity.

Getting Around Toulouse

Toulouse has a great transport system. Buses are frequent and routes are easy to get to grips with. A Metro/bus ticket is based on a set fee (1.30€) a *deplacement* meaning it is possible to change buses and use the Metro system without further charge. A 16-25 *Semvat* travel card can be bought for 7€ which allows you to buy month passes for the bus and Metro for 20€, this is a great deal since you usually need to make at least one return journey a day. Another option is buying a bike, Toulouse is mostly flat with a bike path along the canal leading all the way into town and so is ideally suited for cyclists. There is usually parking outside university residences for cars although you will probably need a bit of French flair when finding a space in town. Cars are best used for exploring the region, which features some breathtaking scenery in the Pyrenees.

Societies at UPS

UPS does not have as many societies to choose from as a typical UK university. Also many of the ones on offer are humanitarian and charity clubs, (the *Amicale des Donneurs de Sang des Universités Toulousaines*, for example – a blood donating society), there are many sports clubs though which you can join temporarily just for weekend or day excursions such as windsurfing, rock-climbing and skiing. I also enjoyed weekly tennis lessons which came at no charge. All sporting activities are organised through *SCUAPS* which is marked on the campus map, information on other societies can be found at the *DVE*.

Lessons at UPS

Most physics lessons are taken in the U4 lecture building or one of the amphitheatres. U4 is relatively modern although fairly sparse. The classrooms are long and often crowded, making reading from the blackboard or overhead projector and hearing the teacher difficult if you are placed near the back. The amphitheatres such as *Grignard* and *Ampère* are rather dilapidated. Many lessons also start at 7.45 in the morning and some finish at 6.30 in the evening, typical duration is one and a half to two hours, which can be a drain to say the least. I took the following modules for my BSc course.

First Semester

Mechanique Quantique

Course Structure: 30h(?) Lectures, 16h TD, 8h TDO

ECTS: 10 with *Mathematiques I*

Syllabus: *Maths intro, QM Postulates, 1D Harmonic oscillator, Angular momentum, Electron spin, Hydrogen atom, Stationary disturbances(?)*

Quantum mechanics was taught from the start using Dirac notation and consequently resulted in little writing in lectures and almost no writing in problem classes (TDs). The course also made heavy use of vector and matrix analogies and operations and although I found it useful that this was covered in the linked companion maths module, it left me standing, still trying to grasp basic notation concepts. I would advise looking up Dirac notation before arrival¹ to avoid being left by the wayside. Although the lecturer, (Prof. C. Rizzo, the Erasmus co-ordinator and Spanish national), received a lot of criticism from the students due to the language barrier, I did not have any more trouble than usual understanding him.

Instrumentation

Course Structure: 18h Lectures, 18h TDO, 36h TP

ECTS: 5

Lessons on the limitations of scientific instruments. I took this course primarily out of curiosity but also through a desire to improve experimental skills. The lectures covered various scientific instruments and ranged in content from flow diagrams specifying the internal processes of a computer to revision of Fourier transforms for electrical noise analysis.

Throughout there were weekly practicals in electronics which were similar to the electronics labs done in the first year (i.e. testing logic tables, techniques for verifying chip manufacturer data etc.) but in greater depth. The equipment was surprisingly good, with digital oscilloscopes, digital signal generators and all in one breadboards. However, I found the approach at UPS to be less 'hands on' than in Bristol, wires were already pre-cut, stripped and colour coded to different sizes, the exact resistors and other components were laid out for you to assemble the appropriate circuit, the practicals tended to be very linear and set out recipe style with little room for your own input. Normally you work as a pair but I did not have a partner throughout.

The first mark for the course, like many others, was based on a mid-term *controle continue*. This was a short exam, which in this case, had nothing to do with the lectures. (It was asking to calculate currents/voltages in a hypothetical circuit). At the end of the year we had a final written exam which asked us questions which we had covered during one of the experiments we had done earlier in the year. There was a practical where we had to repeat a shortened version of an experiment whilst working alone from a brief and also we had to hand in a randomly chosen experimental report write-up.

This module was only worth a few credit points and yet was *a lot* of hours of work. Although I quite enjoyed some of the laboratories, others were painstakingly

¹ *Quantum Physics* by S. Gasiorowicz has a brief introduction, also it is worth looking for explanations online.

boring (verifying internal resistance of a computer's sound card etc.) and also any missed laboratories *must* be redone. Note that there were TDs, but they were computer based, (see my note on TDOs below). I opted not to attend these.

Mathematiques 1

Course Structure: 18h Lectures, 16h TD, 8h TDO

ECTS: 10 with *Mechanique Quantique*

Syllabus: *Matrix operations (changing base, diagonalising, matrix functions/series etc.), Differential equations (Legendre polynomials, Bessel functions, Sturm-Liouville etc.), Hilbert analysis (Definitions, orthogonality, operators, spectral theory)*

Generally quite exciting stuff as far as maths goes, it complimented the quantum mechanics module well. It was taught well (Prof. R. Fleckinger) and, unusually, the notes were made available on the internet.

Manipulation d'atomes a l'echelle nanoscopique (Option)

Course Structure: 18h Lectures, 18h TD

ECTS: 2.5

Syllabus: *Physics behind nanoscale instruments, elastically bound electrons, spontaneous and forced emission, manipulation of atoms by light, optical cooling.*

Covers engineering of atoms using lasers. This was an awful lot of work for a tiny amount of credit points. The first half of the module was delivered by an American, (Prof. J. Weiner) in French although the Power Point notes, (a notable exception in the use of technology at UPS!) were in English. The presentation was available for download and numbered 150 slides each with little explanation of the formulae. In lectures he tended to ramble.

Second Semester

Proprietes electromagnetique de la matiere

Course Structure: 24h Lectures, 16h TD, 8h TDO

ECTS: 10 with *Mech. Analytique* and *Mech. Milieux Cont.*

Syllabus: *Radiation of an oscillating dipole, Polarisation, Maxwell equations, Absorption/dispersion/refraction*

The lecturer in this course was not very popular amongst the students. He crammed in much too much unnecessary work (i.e. pointless derivations etc.) into the already pretty hefty 24 hours of lectures. Extra lectures were organised and it was not unusual for lectures to overflow by quarter of an hour. Also, although it was not really a problem for me, many French students also found his strong German accent difficult to follow.

There were two *controle continues* in this subject which covered the work done so far, the TD tutor was okay although not very approachable.

Mechanique analytique

Course Structure: 12h Lectures, 8 TD, 4h TDO

ECTS: 10 with *Proprietes Electro. de la Mat.* and *Mech. Milieux Cont.*

Syllabus: *Lagrangian mechanics (Hamilton principle, configuration space, Euler-Lagrange equations etc.), Hamiltonian mechanics (Generalised and Hamiltonian impulsive, Hamilton-Jacobi equations etc.), Poisson brackets, Liouville's theorem*
Despite my best efforts, I managed to attend very few of these lectures and TDs. The room changed almost every week seemingly without notice. Taught by the same lecturer as the *Mechanique des milieux continus* it was regarded as a sub-course of that module.

Mechanique des milieux continus

Course Structure: 18h Lectures, 12h TD, 6h TDO

ECTS: 10 with *Proprietes Electro. de la Mat.* and *Mech. Analy.*

Syllabus: *Basics (Stress tensors, Conversion of mass to energy), Basic fluid mechanics (Dynamic pressure fields, Velocity fields, Navier-Stokes and Euler equations), Ideal fluids (Sound waves, St Venant and Bernoulli equations, incompressible 2D fluids), Basic elastic fluids (Deformation tensors, Young's modulus, Poisson coefficient, Cubic symmetry)*

What we would call fluid mechanics. I found this especially interesting although I missed some lectures due to room changes. Although I did not have any trouble, many of the students did not like the lecturer who could be insulting and often overran lessons.

Mathematiques 2

Course Structure: 18h Lectures, 18h TD, 8 TDO

ECTS: 10 with *Physique Stat.*

Syllabus: *Revision (Integration, Series), Complex functions (Holomorphic, Integration – contour method, residual method, Logarithms – gap notation), Integral transforms, Applications of differential equations (Waves, Heat, Schrodinger, Heisenberg uncertainty)*

I found the maths lecturer, who also took us for TDs to be clear and approachable. Much of the course could be found in our *Boas* maths textbooks we used in the second year.

Physique Statistiques

Course Structure: 30h Lectures, 16h TD, 8h TDO

ECTS: 10 with *Mathematiques 2*

Syllabus: *Probability theory (Bayes theorem, Random variables, Generating functions, Central limit theorem, Entropy), Density of states (Free particle in QM, Heisenberg principle, Planck's box), Gibbs set (Principle of equiprobability, weakly coupled systems, Internal/free energy, Gibbs paradox, Maxwell Boltzmann distribution, Dulong & Petit law, Paramagnetism etc.), Quantum statistics (Fermions/Bosons, Bose-Einstein distribution, Photon gas, Black bodies, Fermi-Dirac distribution, Degenerate/non-degenerate systems, Energy capacity of a fermion gas, Astro. Applications)*

The statistical physics course is what we would probably call thermodynamics. Much of what we covered was in the textbook I used last year in Bristol². The lecturer was reasonably understandable and the TD tutor was very helpful.

² *Thermodynamics* by R. Baierlein – Cambridge 2001

Travaux pratiques

Course Structure: 30h

ECTS: 7.5 with *Memoire*

Syllabus: *Optics, thermodynamics*

The laboratories were pretty straightforward. Many are similar to one we did in the first and second year at Bristol such as Fresnel diffraction, Holograms and Peltier devices. The equipment was modern and in good condition, however there was little chance of breakage through mistakes due to the linear, recipe-like, nature of the experiments.

The laboratory staff were *very* helpful and friendly, the optics tutor for example, scheduled some time on his day off to take me through an experiment that I had missed. There was also a revision class at the end of term where we could come in and redo an experiment and ask questions. For the thermodynamics laboratories we were expected to write up a semi-formal report every other week. At the end of the year we had practical exams where we repeat a trimmed down experiment in optics and another in thermodynamics under exam conditions. Like many 'practical' things in France, there was a lot more focus on the theory, each lab started with some form of mathematical derivation exercise. The exam too, unusually, required you to know the formulae by heart despite the fact that you would never use them under any conditions other than that particular experiment.

Memoire

Course Structure: 24h

ECTS: 7.5 with *Travaux Pratiques*

Syllabus: *A project chosen from a list (Landing an aircraft on an aircraft carrier)*

A laboratory lasting two hours a week. We are to choose a basic situation to model and expand on it. Unlike ordinary TDOs (see below), we are expected to write our own code. We are given a ridiculous amount of time to do this project (eight or more weeks), which is relatively simple although open ended.

I found this lesson very frustrating since the university does not provide copies of Matlab for home use and the computer rooms are only open during the day, when you have lessons. We worked in pairs to one computer which meant that only one person could work at a time and I found synchronising work between me and my partner difficult due to the language barrier. The computers we worked on are old and return errors each time you open Matlab, they also take a while, (half a minute or more,) to calculate some of the more complicated models, however the computers available outside of laboratory are much better.

The memoire tutor, (M. Toublanc,) was not very forgiving, in the end I received a zero for missing a fifteen-minute interview.

Travaux Dirigeaux sur l'Ordinateurs (TDOs)

There is a TDO every week which takes up an afternoon and is based on one of the modules. At UPS they use Linux/Windows computers with *Matlab* as the programming language.

After the first three TDOs, I opted out of them since they teach very little computing skills. The format of the lesson involves being given a pre-written Matlab script with some of the variables as blanks. We are expected to calculate suitable variable

values by hand, (for example Eigenvalues of a particular wave function,) and write down the output. To boot, the room is cramped, stuffy with two to a computer.

Some Useful French

Physics Vocabulary

- Aleatoire – Random. Atomic decay is ‘aleatoire’.
- Tension – Voltage
- Champs – Field, as in electric/magnetic fields.
- Onde – Wave, as in Maxwell.
- Valeurs Propres/Vecteurs Propres – Eigenvalues/Eigenvectors
- Pair/Impair – Even/Odd. As in even and odd functions
- Binôme – Binomial. As in series OR Partner. As in lab-partner.
- Frottements - Friction

University Vocabulary

- Decaller – To shift. Lessons are often ‘decallé’, wave phases are ‘decallé’.
- Reporter – To postpone. Lessons are often ‘reporté’
- Anuller – To cancel. Lessons are also often ‘anullé’
- Amphi(théâtre) – Lecture theatre
- Fac(ulté) – University department.
- Polycopie – Handout. Many handouts are given in lessons and you will likely need to photocopy a few off other people.
- Bilan OR Rapport – Report. As in a write-up.
- Femme de ménage – Cleaning lady. To find out when to tidy your room ready for the fortnightly (monthly?) clean.
- Remplir – To fill in. Forms and whatnot.
- Concierge – Hall caretaker. Useful sources of info, usually.
- Tableau d’Affichage – Noticeboard
- Affichage – Notice/Poster

General Vocabulary

- Retraite d’Argent – ATM, Cash point
- Carte Bleue – Debit Card
- Compte – Bank Account
- Solde – Balance
- Carnet de Cheques – Cheque Book
- Mouvements – Transactions
- Ticket aller-retour – Return bus ticket
- Ticket aller-simple – One way bus ticket