



UNC  
GLOBAL

THE UNIVERSITY  
of NORTH CAROLINA  
at CHAPEL HILL

COLLEGE OF ARTS & SCIENCES

STUDY ABROAD OFFICE

FedEx GLOBAL EDUCATION CENTER  
CAMPUS BOX 3130  
CHAPEL HILL, NC 27599-3130

T 919.962-7002  
F 919.962-2262  
studyabroad.unc.edu

December 27, 2011

Administrative Board of the College of Arts and Sciences  
Office of General Education  
UNC-Chapel Hill

Dear Colleagues,

### **Science exchange program at the University of Grenoble, France**

The Departments of Chemistry, Biology, Physics and Mathematics and the Study Abroad Office are seeking your approval for a semester or yearlong student exchange program at the University of Grenoble in France. This is being done within the context of a Memorandum of Understanding (MOU) signed between the two universities to foster various collaborative activities between them, including student and faculty exchanges. In October 2011, a delegation from the University of Grenoble visited UNC-Chapel Hill and reviewed the science curricula of the two universities with faculty from the Departments of Chemistry, Biology, Physics and Mathematics to determine whether undergraduate student exchange was feasible and would allow UNC-Chapel Hill students to remain on track for graduation. This proposal arises directly from the positive conclusions reached as a result of that visit and curricula review.

#### *Rationale*

UNC-Chapel Hill has been sending students to Université Joseph Fourier in Grenoble for many years through the TASSEP science exchange program and UNC-Chapel Hill has received a number of UJF-TASSEP students in return. Over the past couple of years, there has been increased communication between faculty on both campuses and as a result faculty members have expressed the desire to work more closely together and establish a direct link between the two universities in addition to the one mediated by the TASSEP program. A major impetus is the decision in Grenoble to establish an international program in the sciences in which science courses are offered in both French and English. The English taught courses are open to selected French students as well international students. The availability of English taught classes has the potential to increase significantly the number of science students who will elect to study in Grenoble. The addition of this program to the options provided by the Study Abroad Office therefore advances one of the central priorities of the College of Arts and Sciences at the present time, to increase the number of science majors who study abroad.

It is additionally relevant that the University of Grenoble now unites previously separate universities that are now all located on one campus in Grenoble. This single university is now comprised of the Sciences – Université Joseph Fourier, the Humanities – Université Stendahl, the Social Sciences –

Université Pierre Mendés, Grenoble Institute of Technology – INP and Political Sciences – IEP. The great advantage of this unification is that students are no longer limited to taking courses in just one of the universities but may now take main courses in one part of the single institution and add electives from another. Parenthetically, it should be noted that there is also strong interest on the part of the Political Sciences Institute (IEP) to initiate an exchange program with UNC-Chapel Hill.

The Université Joseph Fourier (UJF) is a major university for science, technology and medicine. Created two hundred years ago by Joseph Fourier, it has become a major partner in Grenoble's exceptional scientific environment, with more than 16 000 undergraduate and graduate students, 50 affiliated research laboratories (from CEA, CNRS, INSERM, etc.) and 5 international research centers (the synchrotron facility ESRF, the neutron facility ILL, EMBL for Molecular biology, etc.). Louis Néel, laureate in 1970 for the Nobel prize in Physics, arrived in Grenoble in 1945 and developed the scientific research activity (CNRS, CEA and ILL). Today, 5 professors from the Université Joseph Fourier are members of the French "Académie des sciences".

Grenoble is known as "the capital of the Alps" and is the leading research center in France outside the Paris area. The University of Grenoble hosts one of the largest student bodies in France, offering courses in every discipline. More information about the University of Grenoble can be found here:

[http://www.grenoble-univ.fr/jsp/fiche\\_pagelibre.jsp?CODE=76867170&LANGUE=1&RH=GUGIPFR\\_SITS&RF=GUGIPEN](http://www.grenoble-univ.fr/jsp/fiche_pagelibre.jsp?CODE=76867170&LANGUE=1&RH=GUGIPFR_SITS&RF=GUGIPEN)

### *Description*

The proposed program takes the form of an undergraduate student exchange program for science majors. UNC-Chapel Hill students will therefore be enrolled in courses that constitute the curriculum of the University of Grenoble, alongside French and other international students. UNC-Chapel Hill will similarly receive University of Grenoble science majors who will enroll in courses in our Departments of Chemistry, Biology, Physics and Mathematics. The exchange opportunity will be available for both fall and spring semesters, and for a full academic year. UNC-Chapel Hill students will additionally be required to enroll in a French language course for the duration of their enrollment at the University of Grenoble. As previously noted, a number of science courses are taught in English and are available to French and international students. A UNC-Chapel Hill student with advanced French language skills would be able to take all their courses delivered in French.

Considerable progress has been made in determining course equivalences between the two universities. This will facilitate course selections and transfer of credit on both sides of the Atlantic. An example of courses whose equivalencies have already been established is attached, along with sample syllabi. As a result, UNC-Chapel Hill students will be able to take courses in Biology, Chemistry, Physics and Mathematics at the University of Grenoble in both English and French that they know will transfer back to UNC-Chapel Hill.

More information on courses taught at the University of Grenoble is available here:  
[http://www.grenoble-univ.fr/jsp/fiche\\_pagelibre.jsp?CODE=41685402&LANGUE=1](http://www.grenoble-univ.fr/jsp/fiche_pagelibre.jsp?CODE=41685402&LANGUE=1)

There is ongoing discussion of a faculty exchange within the science program whereby a UNC-Chapel Hill professor would teach a specific science course in Grenoble for UNC-Chapel Hill students, international and French students and a French colleague would come to Chapel Hill and also teach a specific course for UNC-Chapel Hill students. The possibility of a summer lab exchange program is also under discussion.

### *Academic Requirements and Credit*

UNC students participating in this program will need to have 2<sup>nd</sup> semester sophomore standing and a minimum 2.9 GPA. TREQ credit will be awarded as long as the student receives a C or better in each course taken. Students will be required to transfer a minimum of 12 credits per semester back to UNC-Chapel Hill. The language requirement is a minimum of 2 semesters of College French or the equivalent.

### *Logistics, Health and Safety*

#### Facilities

All courses are taught on the campus of the University of Grenoble, which is located on the outskirts of the city. It is easily reached by public transportation (both bus and tram) and students are often seen biking to campus. Since the universities are all on one campus, students have little difficulty going from one building to another. UNC-Chapel Hill students will be matriculated as University of Grenoble students for the duration of their program and will therefore have full access to all university resources and facilities, including the library, cafeterias, internet, and support services, including the support of the International Office.

#### Housing

Students have the option of living in university residences (CROUS) or in a shared apartment. Students will need to complete an online form and for each program there will be someone to help students through the process of finding the right housing for them. Although some university housing is on or near the campus, other housing options may be further away but transportation is quick and easy.

#### Other activities

The University of Grenoble has 250 student associations. EVE, the student social center is a place to meet others at the university. EVE organizes various meetings, concerts, outings and special events where both French and international students meet. There is a café, a student radio station, a reading room and information on cultural and recreational activities as well as a reception service for international students. IntEGre, an inter-university association welcomes international students to Grenoble. The ERASMUS (Europe exchange students program) office also helps exchange students and plans social, cultural and sports events.

#### Health and Safety

In France, health coverage is mandatory. Students are covered by UNC-Chapel Hill's insurance company – HTH; however, students are also required to register at the Student Social Security Coverage: the Sécu. Students will receive help to comply with this required enrolment. The University has an Inter-University Health Center which gives access to many free services including reception services, consultations and preventive medicine in the areas of general medicine,

nursing care, gynecology, psychology, diet and nutrition, tobacco addiction, disabilities, etc. The U.S. Department of State considers France as a developed and stable democracy with a modern economy. Tourist facilities are widely available. Information is routinely shared between the United States and France in order to disrupt terrorist plotting, identify and take action against potential operatives, and strengthen our defenses against potential threats. Although violent civil disorder is rare, there are at times demonstrations and students are advised to avoid these if at all possible.

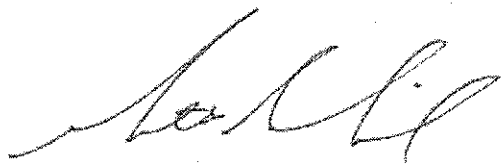
Location

Grenoble can be reached directly by TGV from the Roissy airport in Paris, and cities such as Lyon, Paris, Avignon, Aix-en-Provence and many other cities in France are easily accessible by train or bus.

*Conclusion*

We hope this proposal has given a clear representation of the semester and year-long program at the University of Grenoble available to science students at UNC-Chapel Hill. We hope to develop other possibilities of cooperation within the University of Grenoble. We are happy to provide you with any additional information you might need to aid in your evaluations of this proposal.

Sincerely,



January 13, 2012

---

Dr. Matthew Redinbo, Professor and Chair, Department of Chemistry

Date



1-13-12

---

Dr. Robert Miles, Associate Dean: Study Abroad and International Exchanges

Date

Appendices: document of course equivalencies and sample course syllabi

**Grenoble – UNC Exchange program**  
**Grenoble Science/Math Equivalencies with UNC Courses\***

<b>Biology and Health</b>	Fall semester in English	Spring semester in English
	Cell biology BIO231 = BIOL202 + elective	Biochemistry BIO 241 = CHEM 430
	Genetics BIO 232 = BIOL 202 + elective	Other courses taught in French:
	Physics PHY11a = PHYS 105	Organism BIO 122 = BIO279 + Lab Physiology BIO 242 = BIOL290 + Lab
<b>TOTAL</b>	<b>18 ECTS+ 2 ECTS lab work</b>	<b>20 ECTS</b>

<b>Chemistry</b>	Fall semester in English	Spring semester in English
	Cell biology BIO231 = BIOL 202 + elective	Biochemistry BIO 241 = CHEM 430
	Genetics BIO 232 = BIOL 202 + elective	Other courses taught in French
	Phys Chem PHY236 & CHI 231 (12 ECTS) = CHEM 481 & 481L (5 ECTS) + elective	biology electives taught in English
	Lin Alebra MATH 231 = MATH 547	
<b>TOTAL</b>	<b>18 ECTS+ 2 ECTS Labwork</b>	<b>20 ECTS</b>

<b>Physics</b>	Fall semester in English	Spring semester in English
	Static electromag PHY235 = PHYS311	Dynamic EM PHY351 = PHYS312 In French for the moment, maybe in English later
	Lin Algebra MAT 231 = MATH 547	Other courses taught in French
	Thermo PHY236 [PHY236 & 363 = PHYS 341]	Stat Mech PHY363
	Math.Phys. 351 (in French) = MATH 528/529	
<b>TOTAL</b>	<b>18 ECTS+ 2 ECTS lab work</b>	<b>20 ECTS</b>

<b>Mathematics</b>	Fall semester in English	Spring semester in English
	Lin Alg MAT 231 = MATH 547	Bilinear Algebra MAT241= MATH 577
	Power Series MAT 232 = MATH 521	Series & Fourier MAT 242 = MATH 528
<b>TOTAL</b>	<b>18 ECTS+ 2 ECTS lab work</b>	<b>20 ECTS</b>

\*Grenoble courses use 3 letters (e.g. MAT) while UNC courses use 4 letters (e.g. MATH)

## Electromagnétisme

**Responsable :** Hervé Cercellier

**Coordonnées :** herve.cercellier@grenoble.cnrs.fr, tél : 0476881214

**Gestionnaire de scolarité :** Nathalie Zghighad

**Coordonnées :**

**Site Web :** <https://espaces-collaboratifs.grenet.fr/share/page/site/UJFueDDPHY235/dashboard>

**Pré-requis :**

PHY121, PHY122

**UE obligatoire dans les parcours :**

PGM,PHC,PHY,PMM

**UE à choix dans les parcours :**

MAT

**Compétences visées :**

Maîtriser les notions fondamentales de l'électrostatique, l'électrocinétique, la magnétostatique et l'induction telles qu'énoncées avant Maxwell ; connaître les équations de Maxwell en tant que relations de synthèse, et quelques conséquences immédiates (ex : prédiction des ondes électromagnétiques).

**ECTS :** 6

**Horaires :**

Cours Magistral (CM)	21 h
Travaux Dirigés (TD)	30 h
Heures encadrées	51 h
Travail personnel estimé	66 h

*Le détail de la nature des épreuves de contrôle continu et des épreuves terminales de première et de deuxième session sera communiqué au début du semestre.*

**Programme résumé :**

- Electrostatique : loi de Coulomb, théorème de Gauss, potentiel scalaire, dipôle électrique, théorème de Coulomb, notion de capacité, énergie potentielle électrostatique, travail des forces électrostatiques, notion de diélectrique.
- Electrocinétique : densité de courant, loi d'Ohm, puissance électrique, notion de réseau.
- Magnétostatique : force de Lorentz, relations de Biot-Savart, conservation du flux, théorème d'Ampère, notion de dipôle magnétique, force de Laplace, théorème de Maxwell, énergie potentielle magnétique, travail des forces magnétiques, notions de para, dia et ferromagnétisme.
- Induction magnétique : loi de Faraday, loi de Lenz, auto-induction, induction mutuelle.
- Electromagnétisme : relations de Maxwell et ondes électromagnétiques dans le vide.

Manipulation en amphithéâtre : Les étudiants sont répartis en sous-groupes de 5. Chaque sous-groupe présente en 20 minutes, en amphithéâtre, un des 25 thèmes proposés par les enseignants comme support ou complément du cours, sous la forme soit d'une manipulation, soit d'une vidéo (film commenté, présentation type PowerPoint etc?).

**Epreuves de Contrôle Continu :**

Type	Nature	Coefficient
CC1	épreuve orale	0.40
CC2	épreuve écrite	0.60

**Epreuve Terminale 1ère session (ET) :**

Type	Nature de l'épreuve	Coefficient	Durée
ET	épreuve écrite	1.00	3h

*NB : En cas de désaccord, ce sont les coefficients portés sur le règlement d'examen de la Licence qui prévalent.*

La note finale de l'UE est une moyenne pondérée des notes de contrôle continu (CC1 et CC2) et de la note d'examen terminal (ET), calculée selon la règle suivante.

**Calcul de la note d'UE :**

Règle 2 : la meilleure entre la note d'examen et la moyenne pondérée des trois notes CC1, CC2 et ET avec leurs coefficients.

$$NF = \text{Max}\{ET, (\text{noteCC1} \times \text{coeffCC1} + \text{noteCC2} \times \text{coeffCC2} + \text{noteET} \times \text{coeffET})\}$$

Si l'étudiant se présente en session 2, la note obtenue remplace la note d'examen terminal (ET) de session 1, sinon la note (ET) de session 1 est reportée en session 2. Les notes de contrôle continu sont reportées.

**Commentaires :**



## International Programmes in Science and Technology

### **MAT231** Linear Algebra

**Level:** second year

**Period:** from September to December

**Teaching:** 19.5 hours of lectures, 31.5 hours of exercise classes, 9 hours of lab

**Course Content:**

Vector space, subspace, linear combination, generating family, free family, bases. Finite dimension. Existence theorem of bases. Dimension. Linear mapping, kernel, image, rank.

Complements on linear applications. Matrices associated to a linear mapping. Change of bases.

Reduction of endomorphisms. Eigenvalues and eigenvectors. Diagonalisable and trigonalisable endomorphisms. Fundamental theorem.

Determinant and reduction of endomorphisms

**Exams:** One two-hour written exams during the semester and one two-hour final





## International Programmes in Science and Technology

### **PHY236** Thermodynamics and experimental physics

**Level:** Second year

**Period:** from September to December

**Teaching:** 16.5 hours of lectures, 16.5 hours of exercise classes and 28 hours of labs

**ECTS:** 6

**Course Content:**

**Thermodynamics** (16.5 hours of lectures, 16.5 hours of exercise classes):

- Ideal gas, kinetic theory, thermo-elastic coefficients, reversibility
- First law of thermodynamics: energy exchange by heat or work, Joule's laws.
- Second law of thermodynamics: history, macroscopic formulation of the second law of thermodynamics, statistical approach, Third law of thermodynamics.
- Thermal engines: motor, fridge, heat pump.
- Thermodynamic functions: Enthalpy, Free energy, Free enthalpy, Maxwell's and Clapeyron's equations.
- Phase transitions: triple point, critical point, latent heat.

**Exams:** two written exams.

**Experimental physics** (28 hours of lectures and labs):

**5 options:**

**Acoustics:**

- Introductory lecture on waves and acoustic phenomena
- 3 labs on HI-FI amplifiers, Fourier analysis of sounds of different musical instruments, loud-speakers.
- Experimental projects on stationary waves (pipe organ), loud-speakers, room acoustics, guitar strings.

**Radioactivity:**

- Lecture: interaction of particles and matter, radiation protection, nuclear physics applied to medicine, particle detectors in high energy physics.
- Labs: Geiger-Müller counter, photon attenuation, use of a measurement system based on NaI, calibration.



### **Electronics:**

Operational amplifier.

Introduction to the subject by Lectures and exercise classes.

Two labs on operational amplifiers.

Projects: power amplifier, bass-booster, measurement of light in a room, measurement of temperature, level control of a liquid, battery tester.

### **Energy:**

- Different sources of energy, orders of magnitude,
- Production, transport and storage of energy.
- Transformation and efficiency: thermodynamical approach.
- Energetic balance, concept of energy.
- Different stakes such as consumption, renewable energy, greenhouse effect...
- Measurements: exchange of energy, thermometry.

### **Optics:**

- Divergent and convergent lenses
- Construction of a telephoto lens
- Aberration and photography
- Michelson interferometer
- Polarisation of light, birefringence

Project on photography

**Exams:** lab reports, project, oral presentation.



## International Programmes in Science and Technology

### **CHI231** Thermodynamics and kinetics

**Level:** second year

**Period:** from September to December

**Teaching:** 22.5 hours of lectures, 25.5 hours of exercise classes, and 12 hours of lab

#### **Course Content:**

Chemical thermodynamics: presentation of the different tools used in

- energy exchanges associated to a physical or chemical transformation
- evolution, equilibrium of a system

Applications to the study of a pure body (state diagram) and binary systems (phase diagram)

Chemical kinetics: reaction velocity and influential factors; method for study and determination of order; reaction types (elementary, simple, complex); reactional path and the theory of activated complex; notions of catalysis and examples of applications.

**Exams:** Short tests, lab test, one two-hour final