

# École doctorale de Physique en Île de France

ED564

PSL – UPMC – USPC – UPSaclay

<https://www.edpif.org>

## COURS MESOSCOPIC SPINTRONICS

Taro Wakamura  
LPS Orsay

### Lecture 1

Introduction to spintronics

History of spintronics

1.2 Fundamental phenomena in spintronics

Spin dependent transport

GMR and TMR effect

Spin current and spin relaxation

Anomalous Hall effect and spin Hall effect

Spin transfer torque

### Lecture 2

Recent topics in spintronics

2.1 Spin injection and detection in diverse materials

2.2 Spin Hall effect measurements (using lateral spin valves and spin pumping)

2.3 Interface effects

2.4 Spin carolitronics

### Lecture 3

Spintronics in mesoscopic systems 1

3.1 Spin transport in superconductors

3.2 Spin injection into a superconductor

3.3 Spin Hall effect in a superconductor

3.4 Superconducting spintronics with ferromagnetic Josephson junctions

### Lecture 4

Spintronics in mesoscopic systems 2

4.1 Two dimensional materials for spintronics

4.2 Spin transport in two dimensional materials

4.3 Experimental methods to evaluate spin-orbit interaction (SOI) in materials

4.4 Enhancement of SOI in graphene

#### **EDPIF - PSL**

Dépt de physique de l'ENS  
24, rue Lhomond – 75005 Paris  
Secrétariat : L. LEDEZ  
+33 1 4432 2559  
edpif.ens@edpif.org

#### **EDPIF - UPMC**

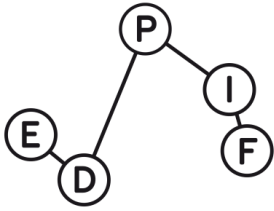
4, place Jussieu - 75005 Paris  
Secrétariat : N. YASSINE  
CC 921. Barre 56/66. Bur 218  
+33 1 4427 8039  
edpif.upmc@edpif.org

#### **EDPIF - UPD**

Bâtiment Condorcet, Bur 376A  
10 r A.Domon et L. Duquet - Paris 13<sup>e</sup>  
Secrétariat: J. TAÏEB  
+33 1 5727 6110  
edpif.upd@edpif.org

#### **EDPIF U-PSUD**

LPS Orsay, Bât 510, porte 145  
Univ Paris Sud - 91405 Orsay  
Secrétariat: S. HOARAU  
+33 1 6915 5356  
edpif.u-psud@edpif.org



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## Lecture 5

Latest issues and future perspectives in spintronics

- 5.1 Valleytronics and Spintronics
- 5.2 Spintronics with topological insulators
- 5.3 Domain wall motion and Skyrmions
- 5.4 Other interesting topics
- 7 two-hours courses

**5 lectures (2 hours each)  
at 10 pm., on Tuesdays  
From May 16<sup>th</sup> to June 13<sup>th</sup> 2017**

**LPS, Bâtiment 510, Orsay, Moyen Amphi**

Contact : Taro Wakamura, [wakamura@lps.u-psud.fr](mailto:wakamura@lps.u-psud.fr)

Inscription : Laura Ledez, gestionnaire de l'ED, [laura.ledez@phys.ens.fr](mailto:laura.ledez@phys.ens.fr)

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