



# Quantum Fields and Fundamental Forces

Imperial College London

# Special circumstances 2020-21

- ❧ This year will be exceptional in a number of ways, owing to the public health situation.
- ❧ Current plans for the whole academic year are for lectures in all courses organized by the undergraduate program (including QFT and Unification) to be given online and asynchronously. There will also be some complementing online synchronous sessions.
- ❧ QFFF MSc level courses will be taught online but synchronously, at least in the autumn term.
- ❧ To enable communication between QFFF students and forming a common course spirit, we plan to divide the class into groups of about six to meet online amongst themselves and with members of staff using Teams.

# Theoretical Physics Group

## ❧ String Theory

Prof. D. Waldram (Head of Th. Phys.)

Prof. K. Stelle (QFFF Director)

Prof. J. Gauntlett

Prof. A. Hanany

Prof. C. Hull FRS

Prof. A. Tseytlin

Prof. T. Wiseman

(Prof. M. Duff FRS)

## ❧ Cosmology

Prof. J. Magueijo

Prof. C. Contaldi

## ❧ Field Theory

Dr T. Evans

Prof. A. Rajantie

(Dr H. Jones)

(Prof. R. Rivers)

## ❧ Quantum Gravity

Prof. C. de Rham

Prof. F. Dowker

Prof. J. Halliwell

Prof. A. Tolley

(Prof. C. Isham)

# Lecture Courses

## ☛ Compulsory

- \* Quantum Field Theory
- \* Quantum Electrodynamics
- \* Particle Symmetries
- \* Unification

## ☛ Optional

Advanced Quantum Field Theory  
Differential Geometry  
Relativity & Cosmology  
Black Holes  
String Theory  
Supersymmetry  
The Standard Model & Beyond

## Undergraduate ( $\leq 2$ only)

Foundations of Q.M.  
Group Theory  
General Relativity  
Quantum Theory of Matter  
Quantum Information

## ❧ 1st Term

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|-----------------------------|-----------------------|
| * Particle Symmetries       | Group Theory          |
| * QFT                       | General Relativity    |
| * QED (cont. into 2nd term) | Quantum Information   |
| * Unification               | Differential Geometry |

New Year's Tests: Quantum Field Theory  
& Particle Symmetries / Unification

## ❧ 2nd Term

Advanced Quantum Field Theory	Foundations of Q.M.
Relativity & Cosmology	Quantum Theory of Matter
Black Holes	Supersymmetry
The Standard Model & Beyond	Strings

## ❧ 3rd Term & Summer

Exams	Special Topics	Dissertation
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# Course Requirements

- ✿ for an overall pass in the MSc - Pass level: 50%
- ❧ The course is divided formally into three Elements: Compulsory & Optional courses & the Dissertation. Each Element must be passed in the aggregate at the 50% level.
- ❧ 4 Compulsory and 4 Optional course exams are needed: 8 exams in total.
- ❧ Individual course exams with marginal fails in the 40%-50% range may be averaged together with other exams in the same Element, provided the overall average for the Element is at least 50%.
- ❧ a Pass (min. 50%) is required in the Dissertation.

## Recommended: 9 Exams

- ❧ Decisions on Passing the MSc and the awarding of Distinction and Merit mentions is at the discretion of the final Examiners' Meeting.

# Distinction and Merit

- The standard Imperial College London definition of an MSc degree with Distinction sets the required performance level at 70%. The QFFF course reports final marks in this scheme, but in fact obtaining a Distinction in QFFF is intentionally harder. On a straight linear scale, the Distinction level in QFFF is more like 80%, in both written exams and in the Dissertation.
- The performance level for an MSc with Merit is 60%.
- More details on Distinctions and Merit degrees are given in the QFFF handbook.

# MSc Dissertation

- ❖ After the end of the written examinations in May - June, students begin work on the final element of the QFFF course: the MSc Dissertation.
- ❖ Selection of a topic and of a Dissertation supervisor is a free choice for students. Supervisors may be members of Staff, postdocs or even people from outside the Theoretical Physics Group. Supervision arrangements with people who are not Theory Group Staff must be confirmed with me.
- ❖ In QFFF, arrangements for the Dissertation are a responsibility of the individual student. It is recommended to begin planning your Dissertation in advance of the summer period.

# Working together

- ❧ As you get to know each other, it is natural for groups of students to form their own study associations. Learning how to work together is an important part of the culture of theoretical physics.
- ❧ All of our courses will have rapid feedback sessions. Integrating a communal work style together with the rapid feedback sessions is to be encouraged.

# Seminars

- There are a large number of seminars, all of which you are welcome to attend. Most relevant, however are the Tuesday general Theory Group Seminars.

## Other important points

- **Deadline for QFFF registration: 24<sup>th</sup> October. However, please register as soon as possible, because a number of online facilities will not work until you do so.**
- All students must provide us with contact and data information and be reachable by phone or email. This is especially important for non-EU students on student visas. It is also important to indicate whether you are in London or remote.
- Advisors: will be assigned soon, once we have compiled a definite class list.

# Some actions required

- ❧ A variety of welcome events are taking place online. Please see the emails, mainly from Loli Sanchez, announcing them.
- ❧ Two on-line courses need to be completed by all MSc students, according to College requirements:
  - \* Safety course
  - \* Plagiarism course
- ❧ Once this year's MSc class members have become acquainted with each other, we will need to have you elect a class representative. The class representative serves as a conduit between the MSc class and the staff. The representative also is invited to attend the Physics Department's MSc committee meetings.

# GSEPS Courses for Master's students

There is a range of courses designed specifically to meet the needs of Master's students. The GSEPS MastersClasses programme is a series of 90 minute lectures including Q&A which takes place on Wednesday lunchtimes during term time.

MastersClasses topics include:

- Note-taking & Reading Effectively
- Research Skills & Reference Management
- Reviewing the Literature
- Stress Management
- Academic Writing
- Poster Presentation Skills
- Developing your Career through Networking
- Interview Skills

As well as two 3-hour workshops:

Interpersonal Skills

Negotiation & Influencing Skills

For course bookings, go to:

[www.imperial.ac.uk/gseps](http://www.imperial.ac.uk/gseps)