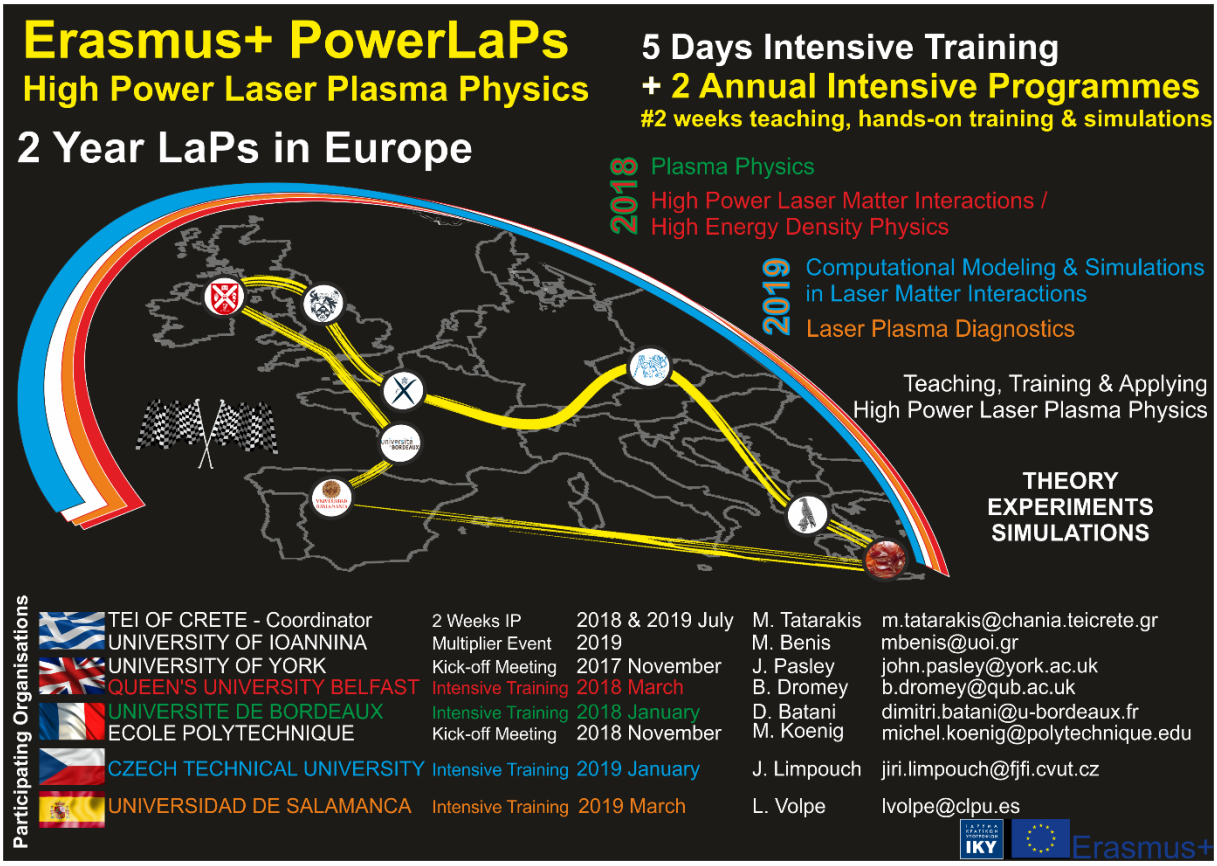
PowerLaPs
"Innovative Education & Training in High Power Laser Plasmas"
Erasmus +



- IP 1 -
C5 SP-HE-IPL - Intensive programmes for higher education learners
C6 SP-IP-HE - Intensive programmes for teaching staff
Rethymnon July 2-13, 2018

"Plasma Physics & High Power Laser Matter Interactions/High Energy Density Physics - Theory and Experiments"

Intensive program on plasma physics and high power lasers

Technological Educational Institute of Crete

Lectures: Michael Tatarakis, Nektarios Papadogiannis, Makis Bakarezos, Vasilis Dimitriou, Eugene Clark, João Jorge Santos, Brendan Dromey, Jiri Limpouch, Luca Volpe, Manolis Benis, John Pasley, Michel Koenig, Laurent Masse

Welcome greetings

- Mayor of Rethymnon: G. Marinakis
- Rector of TEI of Crete: N. Katsarakis
- Vice Rector of TEI of Crete: N. Papadogiannis
- Director of CPPL: M. Tatarakis

Introduction, classification of plasmas/Particles motion in a plasma (2h) *M. Tatarakis*

- Main plasma parameters
- Classification of plasmas
- Single particle motion in a plasma
- Drift velocity
- Magnetic mirrors

Ultrafast laser-matter interactions (2h) *N. Papadogiannis*

- Basics of linear laser matter interaction
- Evolution of laser technology
- Basics of Ultrafast and intense laser technology
- Basics of nonlinear laser matter interaction
- Ultrafast laser-solid surfaces interaction

Basics of laser-atom interactions and atomic processes in plasma (4h) *M. Benis*

- Basics on laser-atom interactions
- Atomic and molecular processes in weak and strong laser fields.
- Basics on scattering theory.
- Electron-ion collisions and related processes in plasma.
- Hi-Tec

Coherent XUV sources (2h) *N. Papadogiannis*

- Atomic excitation and ionization in strong laser fields
- Higher harmonics generation (HHG)
- Attosecond Physics
- Pump-probe experiments in atom and molecules
- Coherent optical control of molecular reactions

Plasma physics and simulations (2h) *J. Limpouch*

- Numerical simulation methods
- PIC simulations
- Numerical schemes
- ALE laser target simulations

Numerical modeling and simulations Lasers/Plasma (2h) *V. Dimitriou*

- Finite Element Analysis
- Finite Element Mathematical Modeling Philosophy
- FEM laser-matter interaction
- FEM/MHD single wire explosion

Laser-driven proton sources and applications (3h) *L. Volpe*

- Laser-driven proton sources
- Protons as diagnostics
- Proton stopping power measurement

Plasma as a fluid /Waves in plasma (2h) ***M. Tatarakis***

- Plasma a fluid
- Waves in plasmas
- MHD equations
- Propagation of E.M. Waves in magnetised plasmas

From perfect gas to QDM: applications to planetary physics (2h) ***M. Koenig***

- Perfect gas
- Statistics for degenerated electrons
- One Component Plasma
- Density Functional Theory
- Quantum Molecular Dynamics (QMD)
- Applications to Planetary Physics

Hydrodynamic instabilities and implications in ICF and astrophysics (2h) ***L. Masse***

- Hydrodynamic instabilities basics
- Linear stability: a good start
- Non-Linear regime and transition to turbulence
- Implications in ICF and astrophysics

Particle Acceleration Lasers/Plasmas (2h) ***E. Clark***

- Laser driven proton beams
- Potential towards laser-driven ion therapy

Warm dense matter (2h) ***B. Dromey***

- Definition of Warm dense matter
- Generation of warm dense matter
- Diagnosis of warm dense matter

High power lasers (2h) ***B. Dromey***

- Fundamentals of laser pulse production
- Designer light
- Ultrafast laser pulses

Principles of indirect drive ICF physics/Shock waves and implosion hydrodynamics (2h) ***J. Pasley***

- Inertial confinement fusion
- Direct and indirect drive
- Pros and cons of indirect drive
- Shock waves and implosion hydrodynamics

Energy transport by laser-generated fast electron beams in dense matter (3h) ***J.J. Santos***

- Phenomenology of intense laser-matter interactions with over-dense targets
- Fast electron beam transport in dense matter
- Diagnostics for fast electron energy transport
- Relativistic electron transport in the context of ICF and HEDM
- Magnetized HED physics

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*All students have to arrive with their own laptop pc. Instructions for software installations will be provided.

	2-Jul	3-Jul	4-Jul	5-Jul	6-Jul	7 & 8	9-Jul	10-Jul	11-Jul	12-Jul	13-Jul
	THEORY LECTURES - PLASMA PHYSICS & HIGH POWER LASER MATTER INTERACTIONS/HIGH ENERGY DENSITY PHYSICS										
	C5 & C6 .. IP 1 .. O1 & O2										
	WELCOME	**N. PAPADOGIANNIS**	**E. BENIS**	**J. LIMPOUCH**	**L. VOLPE**	**Excursion to Arkadi & Ancient Eleftherna Sightseeing guided tour of Rethymno**	**M. KOENIG**	**E. CLARK**	**B. DROMEY**	**J. PASLEY**	**REVIEW & FINAL EXAMS**
09.00-11.00	Mayor of Rethymno, Rector & Vice Rector of TEI of Crete & CPPL Director	Ultrafast laser matter interactions	Basics of laser-atom interactions and atomic processes in plasma II	Plasma Physics and Simulations	Laser-driven proton sources and applications I		From perfect gas to QDM: applications to planetary physics	Particle Acceleration Lasers/Plasmas	High power lasers	Principles of indirect drive ICF physics/Shock waves and implosion hydrodynamics	
	M. TATARAKIS	**E. BENIS**	**N. PAPADOGIANNIS**	**V. DIMITRIOU**	**M. TATARAKIS**		**L. MASSE**	**B. DROMEY**	**L. VOLPE J.J.SANTOS**	**J.J. SANTOS**	
11.15-13.00	Introduction & classification of plasmas/Particles motion in a plasma	Basics of laser-atom interactions and atomic processes in plasma I	Coherent XUV Sources	Numerical modeling and Simulations Lasers/Plasma	Plasma as a fluid /Waves in plasma		Hydrodynamic instabilities and implications in ICF and astrophysics	Warm dense matter	Laser-driven proton sources and applications II Energy transport by laser-generated fast electron beams in dense matter I	Energy transport by laser-generated fast electron beams in dense matter II	
	LABORATORY EXERCISES-PLASMA PHYSICS & HIGH POWER LASER MATTER INTERACTIONS/HIGH ENERGY DENSITY PHYSICS										
	GROUP A	**GROUP B**	**GROUP C**	**GROUP A**	**GROUP B**	**Sponsored by the Municipality of Rethymnon**	**GROUP C**	**GROUP A**	**GROUP B**	**GROUP C**	**ALL GROUPS**
15.00-19.00	*Laser matter interactions* TW ultrafast laser system-Presentation of Laboratories	*Laser matter interactions* TW ultrafast laser system-Presentation of Laboratories	*Laser matter interactions* TW ultrafast laser system-Presentation of Laboratories	*Laser matter interactions* Hands on experiment	*Laser matter interactions* Hands on experiment		*Laser matter interactions* Hands on experiment	*Laser matter interactions & Plasma* Hands on PIC Simulations	*Laser matter interactions & Plasma* Hands on PIC Simulations	*Laser matter interactions & Plasma* Hands on PIC Simulations	
	GROUP B	**GROUP C**	**GROUP A**	**GROUP B**	**GROUP C**		**GROUP A**	**GROUP B**	**GROUP C**	**GROUP A**	
15.00-19.00	*Plasma* focus Hands on experiment	*Plasma* focus Hands on experiment	*Plasma* focus Hands on experiment	*Plasma-Pinch* Hands on experiment	*Plasma-Pinch* Hands on experiment		*Plasma-Pinch* Hands on experiment	*Plasma-Pinch* Hands on MHD simulations	*Plasma-Pinch* Hands on MHD simulations	*Plasma-Pinch* Hands on MHD simulations	**CLOSING SESSION**
	GROUP C	**GROUP A**	**GROUP B**	**GROUP C**	**GROUP A**		**GROUP B**	**GROUP B**	**GROUP C**	**GROUP A**	
15.00-19.00	*Laser matter interactions* Hands on FEM simulations I	*Laser matter interactions* Hands on FEM simulations I	*Laser matter interactions* Hands on FEM simulations I	*Laser matter interactions* Hands on FEM simulations II	*Laser matter interactions* Hands on FEM simulations II		*Laser matter interactions* Hands on FEM simulations II	*Discussion & Evaluation of Lab's*			

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Laboratory courses: three groups of students

- Laboratory session (4h): "TW ultrafast laser system-Presentation of Laboratories"
  I. Fitilis, K. Kosma, Y. Orphanos, S. Petrakis, T. Grigoriadis, M. Bakarezos
- Laboratory session (4h): "Plasma focus-Hands on Experiment"
  A. Skoulakis, G. Andrianaki, G. Tazes
- Laboratory session (4h): "Laser matter interactions-Hands on FEM simulations Part I"
  E. Kaselouris, A. Baroutsos, V. Dimitriou
- Laboratory session (4h): "Laser matter interactions-Hands on Experiment"
  I. Fitilis, T. Grigoriadis, M. Bakarezos,
- Laboratory session (4h): "Plasma Pinch-Hands on Experiment"
  A. Skoulakis, G. Andrianaki, G. Tazes
- Laboratory session (4h): "Laser matter interactions-Hands on FEM simulations Part II"
  E. Kaselouris, A. Baroutsos, V. Dimitriou
- Laboratory session (4h): "Laser matter interactions and plasma-Hands on PIC simulations"
  E. Clark, T. Grigoriadis, G. Andrianaki, G. Tazes
- Laboratory session (4h): "Plasma Pinch-Hands on MHD simulations"
  G. Koundourakis, A. Skoulakis, E. Kaselouris

Final exams (~2h)

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PRACTICAL INFORMATION

www.powerlaps.chania.teicrete.gr

The PowerLaPs site will host announcements and useful information for

https://eclass.chania.teicrete.gr/modules/auth/opencourses.php?fc=23

The e-Class Platform will host documents and educational material

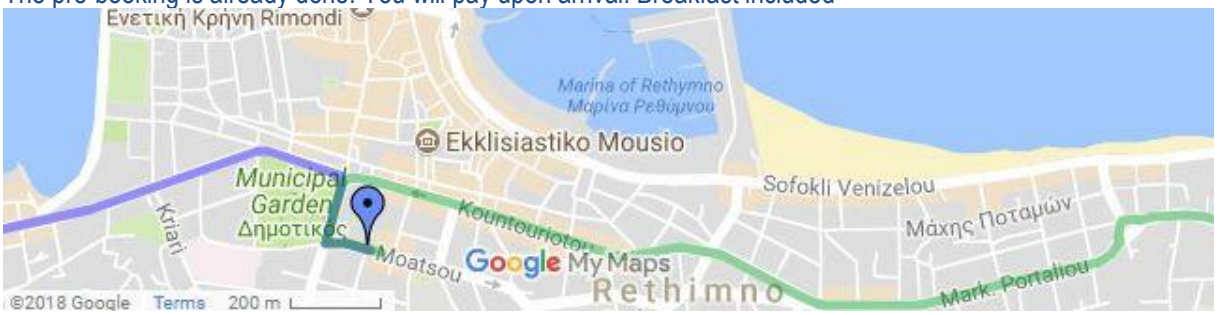
Accommodation for the students

BRASCOS HOTEL

Moatsou kai Daskalaki 1 – 74100 Rethymnon
Tel: +30 2831023721-4
E-mail: brascos@otenet.gr, info@brascos.com
http://www.brascos.com/index.php?sl=en

RESERVATION

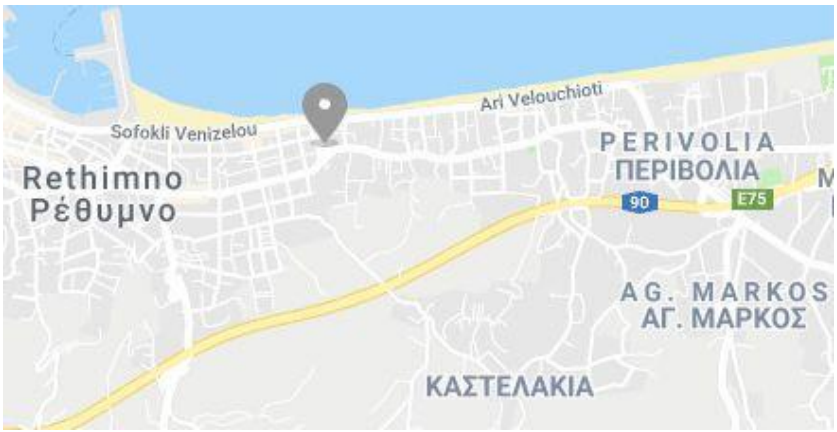
The pre-booking is already done. You will pay upon arrival. Breakfast included



Accommodation for the teachers

MINOS HOTEL

5 Machiton Schollis Chorophilakis, Rethymnon 741 00
T: +30 28310 53921
F: +30 28310 23544
E-mail: info@minos.gr
http://www.minos.gr/



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How to get to Rethymnon:

There is more than one way to reach Rethymnon:

• By air travel to Athens and connecting flight to either Heraklion Airport or Chania Airport and then bus bus terminal (KTEL) travel to Rethymnon. The journey is approx., one hour.

• By air travel from a European city directly to Chania or Heraklion, and then by bus or taxi to Rethymnon as described above.

BY PLANE:

Participants can reach Rethymnon by air travel from Athens via Chania (Daskalogiannis Airport – CHQ) or Heraklion (N. Kazantzakis Airport – HER). Flights between Athens and either of these cities take less than one hour. Information regarding flights and time schedules can be located at the official sites of Aegean Airlines and Olympic Airlines.

Also there are flights of low cost airlines, which connect Heraklion and Chania directly to European cities. For more information you can check the following airlines:

EasyJet (Heraklion or Chania), Transavia (Heraklion or Chania) and Ryanair (Chania).

BY FERRY:

Ferryboat connection between Athens (Piraeus) and Crete is available to Heraklion (MINOAN Lines – ANEK Lines – Blue Star Ferries) or Chania, Souda Bay (ANEK Lines). On arrival at the port of Heraklion or Souda (Chania) travelers can choose between the bus and taxi options above.

TRAVEL IN CRETE:

A) Bus

Crete offers an excellent bus service to take you to any part of Crete at very good prices. On arrival at Heraklion or Chania Airport participants can take a bus or taxi to the city of Heraklion or Chania bus terminal (KTEL) in hourly service from 05:30 to 21:00.

B) Taxi

The rates are more or less fixed for all taxi companies. Transfer by taxi from Heraklion or Chania Airport is below 100€ per transfer from/to airport.

C) Car Rental

Car rental is a convenient way to travel and there are multiple car hire companies offering special deals.

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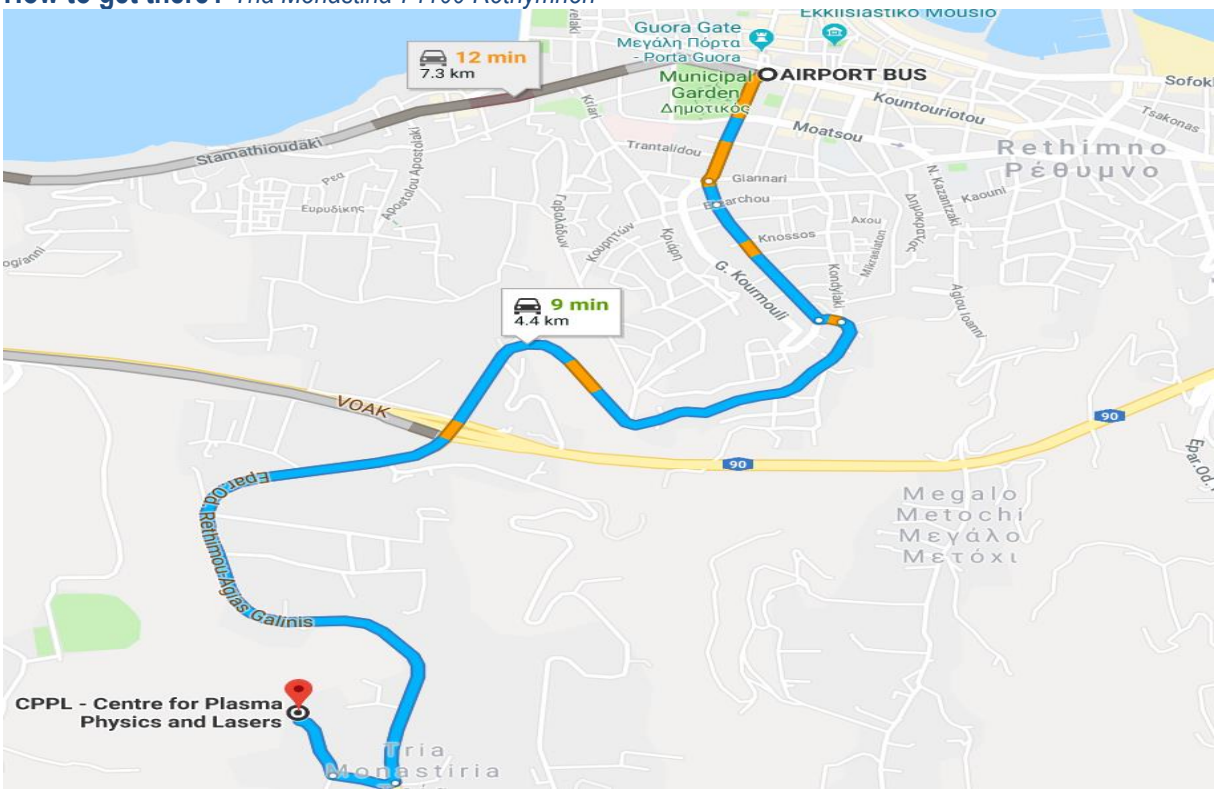
Centre for Plasma Physics & Lasers - CPPL of TEI of Crete

www.cppl.teicrete.gr

How to get there? *Tria Monastiria 74100 Rethymnon*



The Municipality of Rethymnon will kindly provide to all PowerLaPs participants a daily roundtrip by Bus from the Rethymnon to CPPL, for the early lectures and the evening labs, twice a day.
https://goo.gl/maps/Qp3QEUJxGdQ2

We thank and acknowledge the Municipality of Rethymnon, the Departments of Education and Cleaning for their contribution.

2 – 6 July AND 9 – 13 July
Two daily departures:
FROM Rethymnon, Bus stop of Four Witnesses Church at 08:30 & 14:45 TO CPPL
FROM CPPL 13:15 & 19:15 TO Rethymnon, Bus stop of Four Witnesses Church

The Municipality of Rethymnon will also sponsor PowerLaPs participants on:
Saturday 7th of July 09:00
Excursion at Moni Arkadiou and Ancient Eleftherna
Departure from Rethymnon, Bus stop of Four Witnesses Church at 09:00
Sunday 8th of July 10:00
Sightseeing guided tour of Rethymnon
Meeting point, at Four Witnesses Church at 10:00

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