Our Mission

To provide the next generation of combustion researchers with comprehensive knowledge in the technical areas of combustion theory, combustion chemistry, and combustion-related experiments, computation, fundamentals and applications.

The 2016 Session

The 2016 session, scheduled for July 19 to July 25, 2016, will offer five courses: 1. Combustion Chemistry; 2. Combustion Physics; 3. Dynamics of Combustion Waves in Premixed Gases; 4. Fundamentals of Unsteady Combustion and Combustor Processes; 5. Mechanism Reduction and Computational Flame Diagnostics.

Intended Participants

Graduate students, postdocs and faculties in universities; combustion professionals in research organizations; R & D engineers in industries.

Program Dates

Arrival & Welcome Reception: Registration desk will be open on Tuesday, July 19, 2016 from 10:00 am to 5:30 pm at Tsinghua University. This will be followed by an orientation and welcome reception in the evening at 6:00 pm.
Class Schedule: Classes will be held daily from Wednesday, July 20 to Sunday, July 24, 2016.
Conference Dinner: A farewell dinner will be held on Saturday evening, July 23, 2016.
Departure: Lodging check out on Monday, July 25, 2016.

Application Materials

Applications should be made online at *www.cce.tsinghua.edu.cn* before the deadline of Sunday, April 17, 2016. Admission decisions will be sent by Sunday, April 24, 2016. Admitted applicants should remit their registration fee by Sunday, May 15, 2016 to complete the registration. Late applications may be considered depending on space availability.

Location & Accommodation

The Summer School will be held at Tsinghua University, Beijing, China. On-campus dormitory lodging, as well as meal plans covering breakfast, lunch and dinner, are available to all participants. Participants may also make their own arrangements to stay and dine at nearby hotels and restaurants.

Expenses

Registration: 1,000 RMB for students and 1,500 RMB for all other participants.
Meals: Tsinghua canteen cards will be provided to all participants. The cost of the canteen cards and the conference reception and farewell dinners is included in the registration fee.
Lodging: On-campus accommodation will be arranged by the organizing committee. A nominal cost will be paid by the participant. Please visit the summer school web-site for further information.

Course Descriptions

Lecture time：Morning (please select one of the following three courses)

Combustion Physics

Lecturer: Professor Chung K. Law Princeton University
Course Content: This course presents combustion as a rigorous scientific discipline that is characterized by the canonical formulation of the theoretical foundation; the strong interplay between experiment, theory, and computation; and the description of combustion phenomena from the unified viewpoint of fluid mechanics and chemical kinetics. The course consists of three parts, namely: (1) the basic scientific components of chemical thermodynamics, chemical kinetics and transport phenomena; (2) the foundational concepts of premixed and diffusion flames, the limit phenomena of ignition, extinction and flame stabilization, and the aerodynamics of flames; (3) combustion in turbulent, boundary-layer, two-phase, and supersonic flows.

Fundamentals of Unsteady Combustion and Combustor Processes

Lecturer: Professor Tim C. Lieuwen Georgia Institute of Technology
Course Content: This course will cover combustion fundamentals as applied to steady flowing combustion systems, such as burners, gas turbines, and boilers. It will particularly emphasize coupling between kinetic, flame aerodynamic, and fluid mechanics processes that control combustor behavior. The course will discuss pollutant emissions, with particular focus on NOx and CO emissions. Then, it will describe flame stretch processes, flame stabilization, and blowoff physics. It will discuss flame aerodynamics, inherent flame instabilities, and flashback. Finally, it will discuss thermoacoustic instabilities and flame-acoustic interaction processes.

Mechanism Reduction and Computational Flame Diagnostics

Lecturer: Professor Tianfeng Lu University of Connecticut
Course Content: This course will provide an introduction to the methods for mechanism reduction based on graph theory, sensitivity analysis and timescale analyses, etc. Limiting factors for the efficiency of combustion simulations due to the use of detailed kinetics and possible solutions will be discussed. Computational diagnostics based on chemical explosive mode analysis and bifurcation analysis will also be studied. The use of these diagnostics to capture critical flame features, such as ignition and extinction, will be demonstrated for laminar and turbulent flames.

Lecture time：Afternoon (please select one of the following two courses)

Combustion Chemistry

Lecturer: Professor Hai Wang Stanford University
Course Content: Fundamental and application of combustion chemistry: thermodynamics, thermochemical properties, group additivity, basic quantum and statistical mechanics, reaction mechanisms and modeling, transition state theory, RRKM theory, master equation of collision energy transfer, Chapman-Enskog theory, concepts and application of detailed kinetic modeling of laminar reacting flows.

Dynamics of Combustion Waves in Premixed Gases

Lecturer: Professor Paul Clavin Aix-Marseille Université
Course Content: The purpose of this course is to present advances in the theory of unsteady combustion waves in premixed gases; flames, detonations and explosions. Attention will be focused on fundamental aspects and the theoretical analyses will be developed in relation with carefully controlled experiments. The basic approximations of the conservation equations will be discussed first in the context of the structure of the planar waves. The lectures will then cover a large variety of phenomena occurring in many applied fields, ranging from safety in nuclear power plants to rocket or car engines: ignition, quenching, thermo-acoustic instabilities, cellular and turbulent flames, combustion noise, direct and spontaneous initiation of detonations, deflagration-to-detonation transition, Mach-stem formation on shock wave, galloping and cellular detonations. Each of these phenomena will be described by analytical solutions of the simplest model equations capturing the essential physical and chemical mechanisms.

Note on Course Selection

The courses on Combustion Physics and Combustion Chemistry are the foundational combustion courses, suggested to be taken by first-timers especially first-year students. The other three are advanced, enrichment courses.

Poster Session

A poster session will be held to enrich the communication among summer school participants. Each applicant can submit one abstract for the poster session, with related recently published or accepted paper by the presenter attached. Space is limited and decision on acceptance will be made by the organizing committee.

Further Inquiries

Direct inquiries on the academic program or the logistics of participation to either the program administrator, Ms. Hong Tian, (86)10-62796768, ccess@tsinghua.edu.cn, or the program co-organizer, Dr. Yang Gao, gaoyang-00@mails.tsinghua.edu.cn.