PROGRAMME

1. General overview: global situation of protected cultivation (1 hour) (C. Stanghellini)

2. Environmental factors and crop requirements (5 hours) (C. Stanghellini)
   2.1. Greenhouse microclimate and plant interactions (radiation, temperature, humidity, CO2) (2.1 to 2.3: 3 h)
   2.2. Greenhouse energy balance
   2.3. Optimal management of greenhouse climate (sensory systems and data management, modelling)
   2.4. Practical group work on resolution of problems related with climate and energy balance (2 h)

3. Greenhouse design and cladding materials (4 hours)
   3.1. Design criteria for different locations (1 h) (C. Stanghellini)
   3.2. New films and additives (2 h) (J.C. López)
   3.3. Innovations in glass covers with new properties (1 h) (L. Álvarez)

4. Installations for greenhouses (4 hours)
   4.1. Innovation on screen properties: criteria for the selection (1 h) (N.S. Pérez)
   4.2. Dehumidification options (4.2 to 4.4: 2 h) (T. Boulard)
   4.3. Cogeneration (T. Boulard)
   4.4. Geothermal energy (T. Boulard)
   4.5. Artificial lighting and CO2 enrichment (1 h) (P.H. van Baar)

5. Integrated pest and disease management (IPM) and biological control (BC) (4 hours) (E. Vila, M. Pugliese)
   5.1. Successful IPM development models: lessons learnt
   5.2. Recent innovations provided by public research and bioindustry for pest and disease control
   5.3. Challenges and opportunities for future innovation in biocontrol products

6. Innovative greenhouse technologies for water and nutrients management (3 hours) (N. Katsoulas, J.J. Magán, M.D. Fernández)
   6.1. Sensors and decision support systems for irrigation and fertigation
   6.2. Optimum management of closed soilless systems
   6.3. Technologies for improving the use of low-quality water

7. Circular horticulture (2 hours)
   7.1. Use of plant waste from greenhouses (7.1 and 7.2: 1 h) (N. Katsoulas)
   7.2. Use of bio-compostable materials (N. Katsoulas)
   7.3. Recycling plastic materials from greenhouses (1 h) (I. Goyena)

8. Future trends in greenhouse technology (3 hours)
   8.1. Production systems and energy sources (1 h) (A. Sapounas)
      8.1.1. Renewable energy
      8.1.2. (Semi)closed greenhouses
      8.1.3. Indoor/vertical farming
   8.2. Digitalization (2 h) (F. Rodríguez)
      8.2.1. Advanced sensory systems and communication
      8.2.2. Automatization and robotization
      8.2.3. Modelling and decision support systems
      8.2.4. Internet of Things and cloud computing

9. Technical visits
   9.1. Cajamar experimental greenhouses (structures, cladding materials, CO2 capture from flue gases with active carbon)
   9.2. Commercial and experimental greenhouses with BC innovations
   9.3. Greenhouses Luis Andújar (cogeneration for heating and CO2 enrichment)
   9.4. Hintes Oil Europa (valorisation of plastic materials, fabrication of fuels and chemical products)