INTRODUCTION INTO AIR POLLUTION CONTROL

Introducing myself

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Calendar of lectures

- Tuesday 13:30-15.30 – Room T

- Thursday 14:30-16:30 – Room M

The lectures can’t cover in detail all the topics of the course; a personal study is required and therefore specific lectures/books are suggested.

Easy Badge

Easy Badge: Comunicare il codice agli studenti

2 In automatico si sono creati i tre tipi di codice, il docente sceglie quale proiettare

Proietta codice statico	613210	Codice numerico di 6 cifre che lo studente digita nella app. Non cambia ed è facilmente comunicabile anche a voce o scrivendolo sulla lavagna.
Proietta codice dinamico	I13H32QD	Codice alfa numerico di 8 caratteri che lo studente digita nella app. Cambia ogni 30 secondi.
Proietta QR code dinamico		QR CODE dinamico che lo studente inquadra con la fotocamera del cellulare. Cambia ogni 30 secondi.

Lo studente rileva la presenza nell'app OrariUniPD

3 Ogni studente si collega con il proprio dispositivo alla app ORARIUNIPD e sceglie dal menu la voce «rileva presenza»

Si autentica in automatico se ha effettuato il login, oppure inserisce il suo codice fiscale

Lo studente rileva la presenza nell'app OrariUniPD

4 **Indica il posto in cui è seduto:**
in ogni seduta delle aule è applicata un'etichetta che numera i posti (3 cifre)

digita il codice presente sul posto che ha in aula
(esempio **T14**)

o se sta seguendo la lezione on line digita la sigla **XXX**

Se mancasse il numero del posto lo studente dovrà inserire **999**

Lo studente rileva la presenza nell'app OrariUniPD

5 Inserisce il codice della lezione STATICO o DINAMICO
oppure
inquadra il QR-CODE proiettato

clicca sul pulsante Rileva Presenza
il sistema conferma che il Codice lezione sia corretto e conferma la timbratura.

https://www.youtube.com/watch?v=wWJhdivD7nw&feature=youtu.be

AIM

- to identify, classify, and prioritize major emission sources;
- to apply mass balance, chemical equilibrium, and chemical kinetic concepts to estimate pollutant formation rates for a variety of major sources;
- to identify, analyze, design, and evaluate air pollution prevention and control strategies;
- to describe major types of regulations;
- to be critical in environmental decisions.

PROGRAM

- **Introduction:** aim of the course; references; regulations; work groups; definitions; exam modality
- **General concepts and fundamentals:** definition**;** chemical properties; basic properties of gas; acidity; reactions; gas solubility; combustion
- **Air quality alterations**: climate change; acid deposition; photochemical smog; health effect; negative effects of air pollutants on materials and cultural heritage.
- **Regulations**
- **General design consideration**
- **Dust and particulate removal:** Cyclones; Fabric Filters; Electrostatic precipitators
- **Dry techniques**: Dry Sorbent(s) Injection (DSI); Spray Dry Absorption (SDA)
- **Gas absorption techniques**
- **Gas adsorption techniques**
- **Thermal and catalytic conversion**
- **Biofiltration**
- **Aspiration system design**
- **Gas Stack and Plume**
- **Air monitoring**
- **Special topics**

SHARING INFORMATIONS

PASSWORD: APC_2020-2021

WHY WE WANT A CLEANER AIR?

TO RESPECT AIR QUALITY LIMITS, BUT ALSO!

TO PROTECT:

1. WELL-KNOWN ONES
- HUMAN HEALTH
- ANIMALS (fauna) HEALTH
- VEGETATION (NOx, O_3, acid rain, ...)

2. TECHNICAL ECONOMICAL/REASONS:
- MATERIALS EXPOSED TO AIR (Infrastructures - bridges, etc: chemical corrosion by “acid rain”; houses, vehicles,) → SHORTER LIVES AND INCREASED RISKS
- CULTURAL HERITAGE MATERIALS (Buildings, monuments - metals, stone, ……); Indoor pollution (e.g. Old Painting: dust, O_3 colour fading…)

3. TO GET THE AUTHORIZATIONS FOR NEW ACTIVITIES OR REVAMPING AND/OR INCREASE OF EXISTING ACTIVITIES!!

E.G. Line 3 – WI plant in Padova

Pollution in the workplace

An important aspect of air pollution is the presence of pollutants at the workplace. This topic is **not** addressed in this Course.
For those who are, or will be, interested in pollution at the workplace for their profession are requested to consult the European and National legislation. You will find below the up-dated references.

European Agency for Safety and Health at Work

European Safety and Health Legislation
https://osha.europa.eu/en
The aim of EU-OSHA is to identify risks in occupational safety and health.

A wide variety of Community measures in the field of safety and health at work have been adopted on the basis of Article 153 of the Treaty on the Functioning of the European Union.
European directives are legally binding and have to be transposed into national laws by the Member States

Exposure to chemical agents and chemical safety – OSH directives
https://osha.europa.eu/en/legislation/directives/exposure-to-chemical-agents-and-chemical-safety/

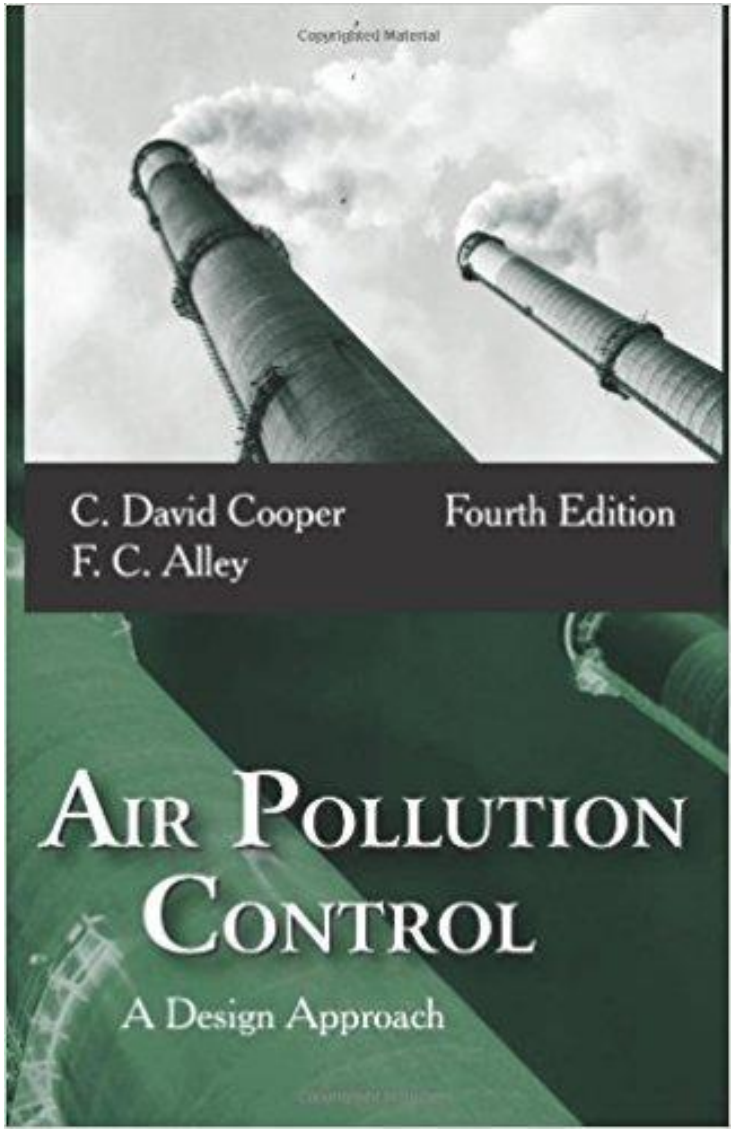
REFERENCES

NOTES

- During the presentations notes and lectures will be “suggested”

- The notes introduce specific details about a topic discussed in the class
- Additional notes are possible during the course

BOOKS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C. David Cooper
F. C. Alley
Fourth Edition
AIR POLLUTION CONTROL
A Design Approach

REGULATIONS

- Industrial Emissions Directive (IED, 2010/75/EU)
- IPPC Directive (2008/1/EC)
- Reference documents under the IPPC Directive and the IED
- Best available techniques Reference document (BREFs) developed under the IPPC Directive and the IED (http://eippcb.jrc.ec.europa.eu/reference/)
- The "BAT conclusions“, a document containing the parts of a BAT reference document laying down the conclusions on best available techniques (http://eippcb.jrc.ec.europa.eu/reference/)

WORK GROUP

«Air Control Award»

Poster Presentation Session

AIM

- To produce a **poster** (format A1) and a **report** (max 10 pages A4) on a specific air pollution control system (stack for MSW incinerators, heating plants; torch for landfill gas; DSI units; SDA units)
- To exercise on data collection from a real case study
- To improve knowledge about air pollution control systems
- To present your work to the class

What to introduce in your work

- If the air pollution control system, that you have defined, represents only a unit in a more complex system, describe briefly the whole system
- Flue gas characterization (flow, composition) before and after the unit
- Criteria for designing
- Dimensions, design graphs, schemes
- Picture of the system
- Process parameters
- Equipments: reactants, pumps, tubes, etc.
- Material analysis
- Requirements according to EU regulations
- Maintenance Program
- Cost analysis (Euro/Nm^3): construction and operative costs. Bill of quantity analysis could be useful to apply

Suggestions

- The work represents 7 points
- Remember that the work is related to a real case study
- You are required to properly analyse only the defined unit and not all the system
- The **poster** should summarize your work; its presentation will be held at the end of the course and you have 5-10 minutes to present it to the «jury»
- The **report** is a supplementary document in which more details are reported.
- Choose your partners and name a coordinator; Fill these informations in the file shared in moodle.

An Alternative….

- 5 minutes of video
- You can use several tools (powtoon, etc.)

https://app.wooclap.com/XGNTTN/questionnaires/5f71b221af050b19950f99de

FURTHER ACTIVITIES

Evaluation during the course

https://www.wooclap.com/

THE ONE -MINUTE PAPER

1) What is the most important thing you learned in class today?

2) What question remains uppermost in your mind?

NEWSPAPER ARCHIVE

«Newspaper» forum activity

Commission warns Germany, France, Spain, Italy and the United Kingdom of continued air pollution breaches

Brussels, 15 February 2017

"The European Commission sends final warnings to Germany, France, Spain, Italy and the United Kingdom **for failing to address repeated breaches of air pollution limits for nitrogen dioxide (NO_2).** NO_2 pollution is a serious health risk. Most emissions result from road traffic.

The European Commission urges 5 Member States to take action to ensure good air quality and safeguard public health. More than 400 000 citizens die prematurely in the EU each year as a result of poor air quality. Millions more suffer from respiratory and cardiovascular diseases caused by air pollution. Persistently high levels of nitrogen dioxide (NO_2) caused almost 70 000 premature deaths in Europe in 2013, which was almost three times the number of deaths by road traffic accidents in the same year.

EU legislation on ambient air quality () sets limit values for air pollutants, including nitrogen dioxide. In case such limit values are exceeded, Member States are required to adopt and implement air quality plans that set out appropriate measures to bring this situation to an end as soon as possible.

Today's reasoned opinion concerns persistent breaches of NO_2 limit values in:

….

-**Italy** (12 air quality zones, including Rome, Milan and Turin);"

EXAM

At the end of the year a collection of exercises with solutions will be made available for the students !!!!

EXAM MODALITY

- The exams is based on three parts:
  - An written/oral exam: **20 points**
  - The presentation of the work group: **7 points** (excellent = 7 points; good= 6 points; fair = 5 points)
  - Other activities during the course (questions in «wooclap», discussion on the «one minute paper», etc.) : **3 points** (very active participation = 3 points; adequate participation = 2 point ; sufficient participation = 1 point)

EXAM DATES

One at the end of January			
One in February One in June/July One in September			