

USER GUIDE

INTRODUCTION

This course is designed with the goal that students acquire an overview of the use of carbon nanotubes (CNTs) and their potential applications, and how they can be introduced into the traditional processes of plastic processing.

The online system was chosen and so the course must be done through Internet, thus is accessible and available and offers a total freedom of schedules.

The online life-long education courses provide great benefits to the student:

- Maintain the student abreast of technological developments in its sector and refresh the knowledge.
- Allow students to connect at any time and place, with total freedom of schedules.
- Motivate a daily study, raising and creating questions, encouraging students to consult different sources.
- Bring study materials to students, not being necessary to travel great distances.
- They may a direct contact with the best national and international specialists.
- Promote discussion among professionals in Spain, Greece, Germany and Cyprus and allowing you to compare different views, methods, personal experiences, tips, etc.

Each module is based on the development of a theoretical interactive part complemented by a practical content and the possibility of discussion using discussion forums and email with tutors.

Pedagogically this course is an advanced model than the traditional "I know, you do not know, I'll tell you," a system in which the protagonist is a student who is who needs to practice and learn.

The teaching team that wrote the contents are true specialists in the field, ensuring that the information is very accurate and is adapted to the plastics processing industry. The team and tutors will support and coordinate the different activities, boost the participation of each student, will resolve the doubts and provide valuable advice.

SYSTEM REQUIREMENTS

To access the platform where the course will take place must write in the address bar:

<http://formation.tanocomp.eu>

To surf through the platform requires a computer system having at least:

- Navigation system broadband or dial-up modem.
- Web browser: Firefox 8, IE 8, Safari 5, Chrome 11, Open 9
- Flash Player. The link to download the latest version of Macromedia is:
<http://www.macromedia.com/go/getflash/>
- Java. The link to download the latest version of Java is:
<http://java.com/es/download/index.jsp>

To see and hear the activities leading audio and/or video integrated the following components are needed:

- Speakers.
- Sound card.
- Program video display.

In the center of the screen, there are two boxes for entering the user name and password, which will provide each student previously.

You click on "enter" and accessed the homepage of the platform, where the course TANOCOMP will be chosen to access the main page of the course.

Students should have some basic computer user level: file management, word processing, web browsing and email, just as knowing the use of the basic tools of office automation in Windows environment.

NAVEGATION IN THE PLATFORM

To enter the platform provides a user name and password.

<http://formation.tanocomp.eu>

In the first screen (Home) are two menus on the left and in the middle.

Left menu:

Here are the following sections:

Navegation: access to student courses (TANOCOMP-My courses) and view the student's profile (My Profile). Within My Profile is the message handling, the profile and My Private Files (student's files).

Central Menu:

In this menu a list of the courses in which the student is targeted, a list of all available courses in the areas divided by platform and a section with site news. Once selected the course, it enters course page of the, in this case TANOCOMP.

The screenshot shows the TANOCOMP platform interface. At the top left is the TANOCOMP logo with the tagline 'e-learning training on nanotechnology For the plastics industry'. At the top right is a language dropdown menu set to 'English (en)'. Below the header is a 'Home' section. On the left is a 'Navigation' sidebar with a 'Home' link and two sub-links: 'My profile' and 'My courses'. The main content area is titled 'My courses' and features a course card for 'TANOCOMP'. The card includes the text 'Trainer: Trainer Tanocomp' and a description: 'Training on the nANOTECHNOLOGY aspects of plastic COMposites with enhanced properties for use in high-strength applications'. Below the course card is a 'Courses' section with a 'General' category containing a link to 'TANOCOMP'. A search bar for courses is located below the courses section, with a 'Go' button. At the bottom of the page, there is a 'Forum TANOCOMP' section with a note '(No news has been posted yet)' and a 'Subscribe to this forum' link.

In this new window are two different menus:

Left menu:

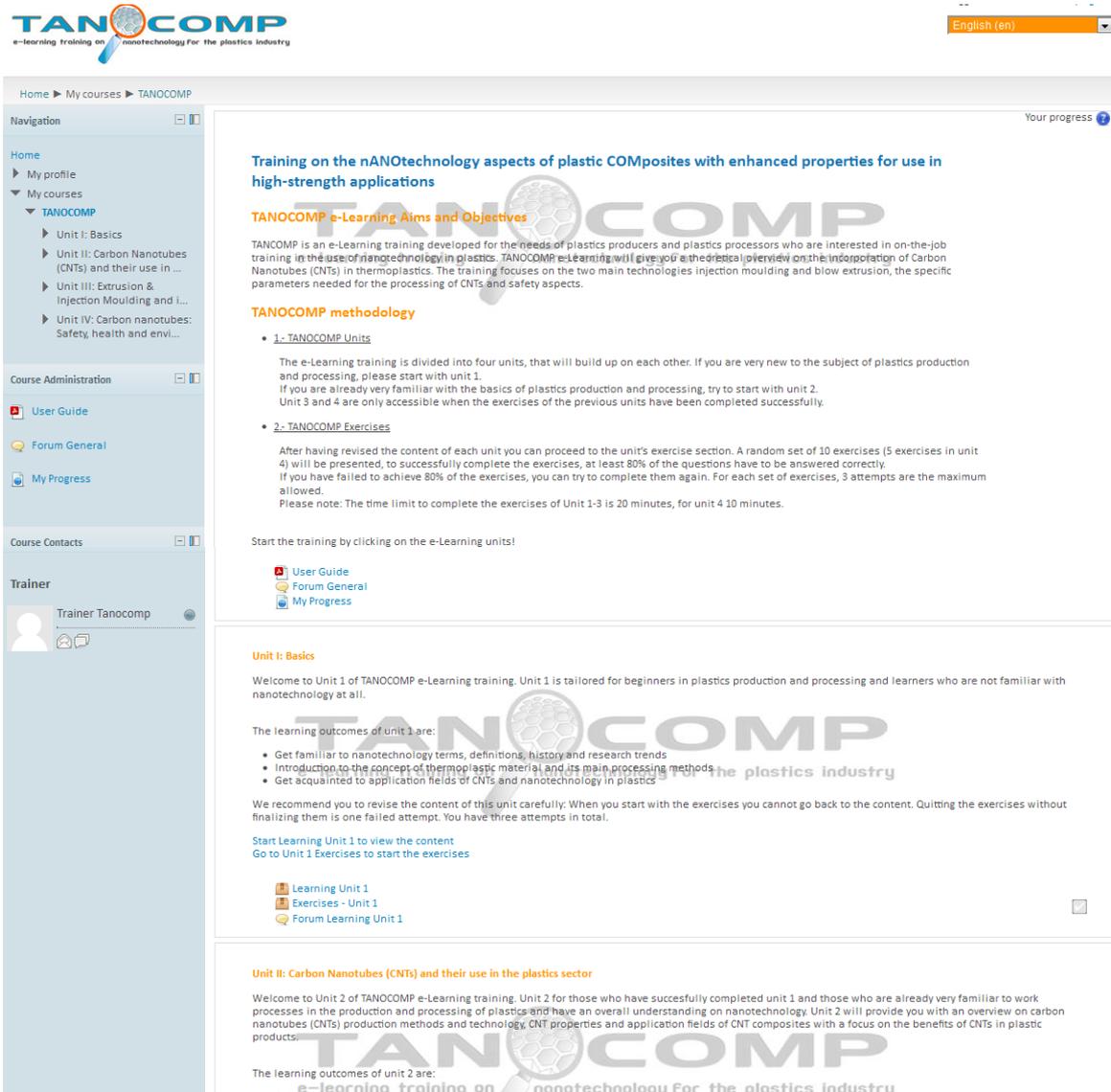
In addition to the above on the previous screen, in Navigation are pull down menu (learning units I, II, III and IV). Each one includes: content, exercises and forum.

Course administration: Includes user guide, the general forum and My Progress, where students can check their progress in each of the units.

Course Contacts: Allows direct contact with trainers that will solve the student doubts.

Central Menu:

In this area of the screen displays the contents of the course divided by sections or units within each section is a summary and a list of chapters and activities that comprise it.



The screenshot displays the TANOCOMP e-learning platform interface. At the top, the logo and language selector (English (en)) are visible. The main content area is titled "Training on the nANOTEchnology aspects of plastic COMposites with enhanced properties for use in high-strength applications".

TANOCOMP e-Learning Aims and Objectives

TANOCOMP is an e-Learning training developed for the needs of plastics producers and plastics processors who are interested in on-the-job training in the use of nanotechnology in plastics. TANOCOMP e-Learning will give you a theoretical overview on the incorporation of Carbon Nanotubes (CNTs) in thermoplastics. The training focuses on the two main technologies injection moulding and blow extrusion, the specific parameters needed for the processing of CNTs and safety aspects.

TANOCOMP methodology

- 1- TANOCOMP Units**
The e-Learning training is divided into four units, that will build up on each other. If you are very new to the subject of plastics production and processing, please start with unit 1. If you are already very familiar with the basics of plastics production and processing, try to start with unit 2. Unit 3 and 4 are only accessible when the exercises of the previous units have been completed successfully.
- 2- TANOCOMP Exercises**
After having revised the content of each unit you can proceed to the unit's exercise section. A random set of 10 exercises (5 exercises in unit 4) will be presented, to successfully complete the exercises, at least 80% of the questions have to be answered correctly. If you have failed to achieve 80% of the exercises, you can try to complete them again. For each set of exercises, 3 attempts are the maximum allowed. Please note: The time limit to complete the exercises of Unit 1-3 is 20 minutes, for unit 4 10 minutes.

Start the training by clicking on the e-Learning units!

Unit I: Basics

Welcome to Unit 1 of TANOCOMP e-Learning training. Unit 1 is tailored for beginners in plastics production and processing and learners who are not familiar with nanotechnology at all.

The learning outcomes of unit 1 are:

- Get familiar to nanotechnology terms, definitions, history and research trends
- Introduction to the concept of thermoplastic material and its main processing methods
- Get acquainted to application fields of CNTs and nanotechnology in plastics

We recommend you to revise the content of this unit carefully. When you start with the exercises you cannot go back to the content. Quitting the exercises without finalizing them is one failed attempt. You have three attempts in total.

Start Learning Unit 1 to view the content
Go to Unit 1 Exercises to start the exercises

Learning Unit 1
Exercises - Unit 1
Forum Learning Unit 1

Unit II: Carbon Nanotubes (CNTs) and their use in the plastics sector

Welcome to Unit 2 of TANOCOMP e-Learning training. Unit 2 for those who have successfully completed unit 1 and those who are already very familiar to work processes in the production and processing of plastics and have an overall understanding on nanotechnology. Unit 2 will provide you with an overview on carbon nanotubes (CNTs) production methods and technology, CNT properties and application fields of CNT composites with a focus on the benefits of CNTs in plastic products.

The learning outcomes of unit 2 are:

- Gain an insight on CNTs production method
- Gain clear understanding on CNTs properties
- Getting aware on the benefits of CNTs to the plastics industry

We recommend you to revise the content of this unit carefully. When you start with the exercises you cannot go back to the content. Quitting the exercises without finalizing them is one failed attempt. You have three attempts in total.

[Start Learning Unit 2 to view the content](#)
[Go to Unit 2 Exercises to start the exercises](#)

- 📖 Learning Unit 2
- 📄 Exercises - Unit 2
- 🗨️ Forum Learning Unit 2



Unit III: Extrusion & Injection Moulding and incorporation of CNTs

Unit 3 is only accessible for learners who have successfully completed the exercises of TANOCOMP unit 2.

Unit 3 will provide you with an overview on masterbatches with CNTs, list different compounds and a benefit/cost analysis, the definition of parameters in the processing (extrusion and injection moulding) of thermoplastics with CNTs and its challenges.

The learning outcomes of unit 3 are:

- Get acquainted to general aspects related to masterbatches with CNTs (Definition, costs, production parameters)
- Gaining an overview of extrusion process parameters for processing thermoplastics with CNTs
- Gaining an overview of injection moulding process parameters for processing thermoplastics with CNTs
- Gaining a general understanding on the challenges of CNT properties and thermoplastic production

We recommend you to revise the content of this unit carefully. When you start with the exercises you cannot go back to the content. Quitting the exercises without finalizing them is one failed attempt. You have three attempts in total.

[Start Learning Unit 3 to view the content](#)
[Go to Unit 3 Exercises to start the exercises](#)

- 📖 Learning Unit 3
- 📄 Exercises - Unit 3
- 🗨️ Forum Learning Unit 3



Unit IV: Carbon nanotubes: Safety, health and environmental issues

Unit 4 is only accessible for learners who have successfully completed the exercises of TANOCOMP unit 3.

Unit 4 will provide you with details on toxicological and eco-toxicity data on carbon nanotubes (CNTs), the handling of CNTs during synthesis and product development, awareness and good practice in CNT handling and an overview of national and European regulations.

The learning outcomes of unit 4 are:

- Getting familiar with toxicity aspects of CNTs
- Getting acquainted with safety aspects of handling CNTs during synthesis and production of thermoplastics
- Gaining awareness of good practice in CNT handling
- Gaining an overview of national and European regulations of handling CNTs

We recommend you to revise the content of this unit carefully. When you start with the exercises you cannot go back to the content. Quitting the exercises without finalizing them is one failed attempt. You have three attempts in total.

[Start Learning Unit 4 to view the content](#)
[Go to Unit 4 Exercises to start the exercises](#)

- 📖 Learning Unit 4
- 📄 Exercises - Unit 4
- 🗨️ Forum Learning Unit 4



COMMUNICATION IN THE PLATFORM

Forums: are asynchronous communication spaces and visible to all users. They are grouped by categories that organize the topics discussed. When you access a category, are the issues that have been created to know the opinion of the student according to the activities that the teacher has planned. In each forum displays information about the number of interventions, the moderator and the creation date.

Mails: the internal mail allows you to communicate privately with tutors and other students. Upon entering this section, students can check for new messages either from other students and teachers or course tutors.

TYPES OF EXERCISES

The exercises in learning units can be of several types:

Multiple choice: the student must mark those responses that think appropriate by clicking on the boxes.

Exercise #2

Safety during production of CNTs-thermoplastics composites mandates (multiple answers may apply):

- A) High efficiency local exhaust
- B) Impervious gloves
- C) Containment of the source
- D) None of the above



Matching: relates an option with another, relating the left column to the right through the pull down menu

Exercise #9

Relate the current applications of CNTs and their added value in the automotive sector

Application	Added Value
<input type="text" value="Lubricants with nanospheres"/>	A) Electrostatic shield
<input type="text" value="Tanks with CNTs"/>	B) Ultra high Young's Module
<input type="text" value="Engine components with CNTs"/>	C) High electrical conductivity
<input type="text" value="Sensors"/>	D) Reduction of friction



Sort: you place your answers in the correct order or are grouped in the order suggested by choosing from the options provided, as seen in the first case.



Exercise #8

Point out which of the following advantages of masterbatches are over CNTs liquid dispersions (point D) or powders CNT (point P):

- Formulation flexibility
- CNTs are predispersed
- Easy to handle
- Lower cost in % of CNTs

Or clicking and dragging the right answer with your mouse until to place it in the correct order as in this second case.



Exercise #8

Sort out the materials from highest to lowest by their use in nanotechnology (1st is more used-4th less used)

- A) Titanium
- B) Carbon
- C) Silica
- D) Silver