



Co-funded by the
Erasmus+ Programme
of the European Union



TECHNISCHE
UNIVERSITÄT
DRESDEN



LEADING IN FIBRE
& TEXTILE TECHNOLOGY
The Research Institute
of University of Excellence

KNOWLEDGE ALLIANCE



ICT IN TEXTILE AND CLOTHING
HIGHER EDUCATION AND BUSINESS

Apparel Design and Production

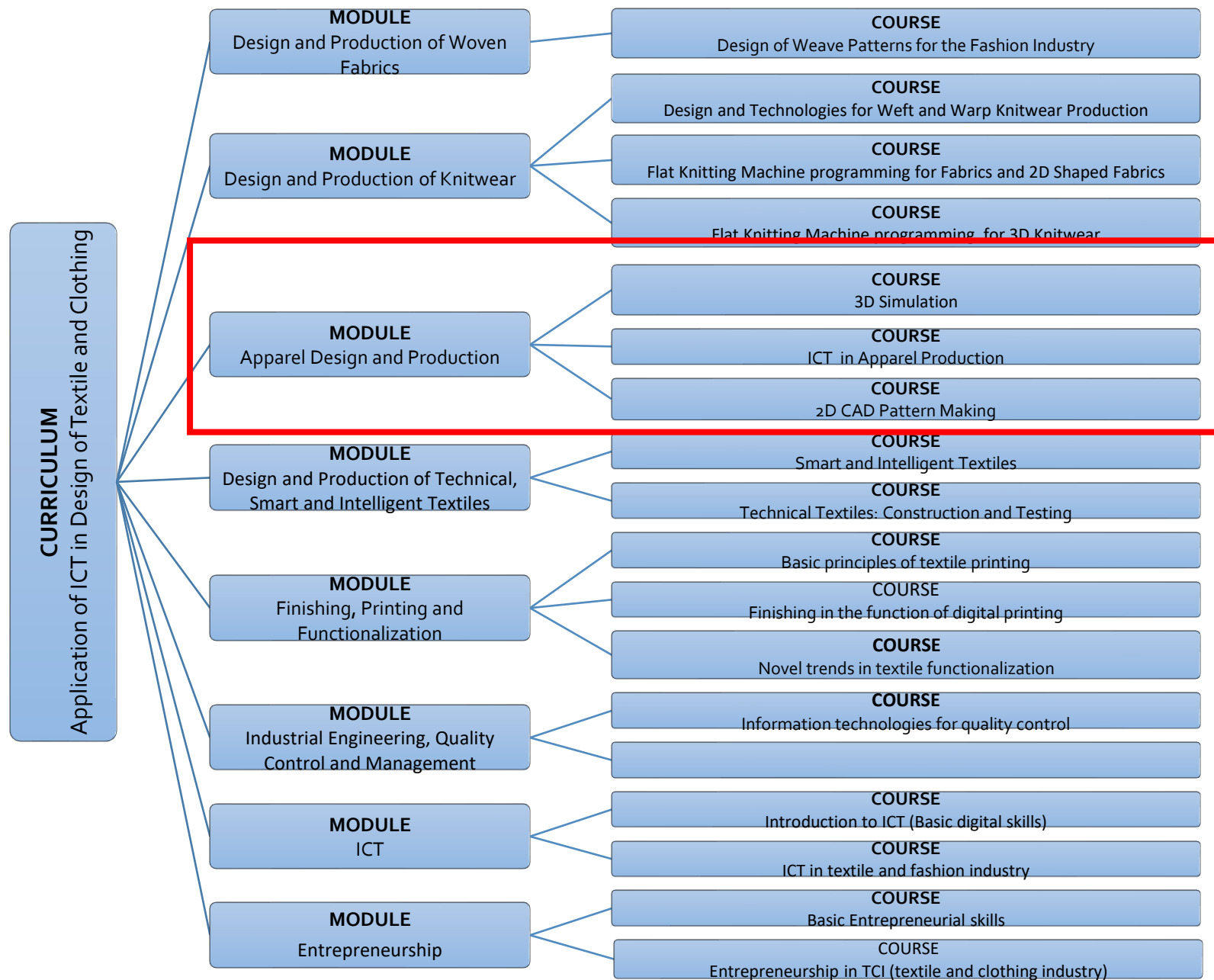
3D CAD

Dr. Hassan Saeed

Chair of Development and Assembly Technology for Textile Products
Institute of Textile Machinery and High Performance Material Technology
TU Dresden, Germany

ICT IN TEXTILE AND CLOTHING HIGHER EDUCATION AND BUSINESS (ICT - TEX)

ICT-TEX project Nr. 612248-EPP-1-2019-1-BG-EPPKA2-KA,
funded by the Erasmus + Programme of the European Union



MODULE – APPAREL DESIGN AND PRODUCTION

Course: 3D Simulation

Duration: 30 hours

Course objectives

Three-dimensional (3D) virtual prototyping is getting increasingly importance for apparel design. Based on the utilization of 3D CAD simulation, the product development in the clothing industry becomes faster and faster. The integration of 3D CAD systems for garment design leads to higher accurate cloth fitting. During the course the participants will be guided to create the virtual garments from fashion design idea analyzing the principal aspects of 3D simulation by using specific software.

Topics

- Introduction of 3D simulation
- 3D virtual model
- Virtual fit simulation in CLO3D

Learning outcomes

Knowledge	Skills	Responsibilities/autonomy
<ul style="list-style-type: none">- To have an overview about the application of 3D simulation in the clothing sector- To evaluate pro and cons of 3D simulation- To be aware of the different steps and methods to apply in the 3D simulation process- To understand the importance and the procedure to create a 3d virtual model- To get knowledge of the main functionalities of the CLO3D software	<ul style="list-style-type: none">- To realise an avatar choosing the more suitable principles and characteristics in accordance with the product purposes and features- To apply different methods to generate a 3D human model, checking for and making eventual corrections and setting a system of sizes- To run CLO3D software using its different functionalities: avatar customization, 2D patterns settings, material and details characterization, grading, rendering and animation- To evaluate the fit, making corrections and changes to obtain the desired result / effect	<ul style="list-style-type: none">- To develop a fashion solution using 3D virtual prototyping technology sourcing from traditional craftsmanship knowledge- To translate ideas and vision into experiments and digital products relating them to fashion tendency and production processes- To use traditional garment craftsmanship

3D CAD Simulation

Course division

- Introduction of 3D simulation
- 3D virtual model
- Virtual Fit Simulation in CLO 3D
- Interactions with teachers through Discussion forums
- Interactive Quiz sections
- Wiki Interactions

The screenshot displays the ICT-TEX Project platform interface. The browser address bar shows 'platform.ict-tex.eu'. The page title is 'ICT-TEX Project platform' with a user profile for 'Hassan Saeed'. The left sidebar contains a navigation menu with the following items: 3D CAD (highlighted), Participants, Badges, Competencies, Grades, General, Introduction and Historical Background of 3D CAD, 3D Virtual Human Model, Virtual Fit simulation in CLO 3D, Materials for Teacher, Topic 5, Dashboard, Site home, Calendar, Private files, Content bank, My courses, ICT-TEX Documents, Moodle workshop, Apparel production, ICT II, 2D-CAD-PM, and 3D CAD (highlighted).

The main content area shows a list of course topics with checkboxes for completion. Three topics are highlighted with red boxes:

- Introduction and Historical Background of 3D CAD**: Includes Historical Background, Importance of 3D CAD in Clothing, Self Assessment Quiz, and Discussion Forum.
- 3D Virtual Human Model**: Includes 3D Body presentation, Virtual Human Model, Material Characterization, Scanning Technology, Self Assessment Quiz, and Discussion Forum.
- Virtual Fit simulation in CLO 3D**: Includes Installation of CLO 3D (Trial Version), User Interface of CLO 3D, Avatar Customization, 2D Construction in CLO 3D, Fit Simulation, Use of sewing accessories, Kinematic Simulation Modelling, Self Assessment Quiz, and Discussion Forum.

The right sidebar shows 'Administration' options: Course administration, Edit settings, Course completion, Users, Filters, Reports, Gradebook setup, Badges, Backup, Restore, Import, Reset, Question bank, and Recycle bin.

3D CAD Simulation

Course division

- **Historical Background**
- **Importance of 3D CAD in Clothing**
- **Interactions with teachers through Discussion forums**
- **Interactive Quiz sections**
- **Wiki Interactions**

The screenshot displays the ICT-TEX Project platform interface. The browser address bar shows 'platform.ict-tex.eu'. The page title is 'ICT-TEX Project platform' with a user profile for 'Hassan Saeed'. The main content area is divided into three sections:

- 3D CAD**: A list of course topics with checkboxes for completion. The first two topics, 'Introduction and Historical Background of 3D CAD' and '3D Virtual Human Model', are highlighted with a red box. The list includes:
 - Historical Background (checked)
 - Importance of 3D CAD in Clothing (checked)
 - Self Assessment Quiz (checked)
 - Discussion Forum (checked)
- 3D Virtual Human Model**: A list of topics with checkboxes for completion:
 - 3D Data presentation (checked)
 - Virtual Human Model (checked)
 - Material Characterization (checked)
 - Scanning Technology (checked)
 - Self Assessment Quiz (checked)
 - Discussion Forum (checked)
- Virtual Fit simulation in CLO 3D**: A 3D rendering of a female avatar in a bikini next to a piece of fabric. Below it is a list of topics with checkboxes for completion:
 - Installation of CLO 3D (Trial Version) (checked)
 - User Interface of CLO 3D (checked)
 - Avatar Customization (checked)
 - 2D Construction in CLO 3D (checked)
 - Fit Simulation (checked)
 - Use of sewing accessories (checked)
 - Kinematic Simulation Modelling (checked)
 - Self Assessment Quiz (checked)
 - Discussion Forum (checked)

The right sidebar contains an 'Administration' section with options for course management, including 'Edit settings', 'Course completion', 'Users', 'Filters', 'Reports', 'Gradebook setup', 'Badges', 'Backup', 'Restore', 'Import', 'Reset', 'Question bank', and 'Recycle bin'.

3D CAD Simulation

Introduction of 3D Simulation

- **Historical Background**
- **Importance of 3D CAD in Clothing**
- **Interactions with teachers through Discussion forums**
- **Interactive Quiz sections**
- **Wiki Interactions**

The screenshot shows the ICT-TEX Project platform interface. The top navigation bar includes the ICT-TEX logo and the text 'ICT-TEX Project platform'. The left sidebar contains a menu with items like '3D CAD', 'Participants', 'Badges', 'Competencies', 'Grades', 'General', 'Introduction and Historical Background of 3D CAD' (highlighted), '3D Virtual Human Model', 'Virtual Fit simulation in CLO 3D', 'Materials for Teacher', 'Topic 5', 'Dashboard', 'Site home', 'Calendar', 'Private files', 'Content bank', 'My courses', 'ICT-TEX Documents', 'Moodle workshop', 'Apparel production', 'ICT II', '2D-CAD-PM', and '3D CAD'. The main content area is titled '3D CAD Simulation' and includes a breadcrumb trail: 'Dashboard / My courses / 3D CAD / Introduction and Historical Background of 3D CAD / Historical Background / Historical Background of 3D Simulation / View'. Below this is a search bar and a 'Search wikis' button. The main heading is 'Historical Background', followed by a brief description: 'This lecture presents a brief historical background of 3D CAD simulation in clothing.' Below the description are tabs for 'View', 'Edit', 'Comments', 'History', 'Map', 'Files', and 'Administration'. A 'Printer-friendly version' link is also present. The 'TABLE OF CONTENTS' section lists the following items: 1. Historical Background, 2. Important factors for 3D simulation (with sub-items: 2.1. Shape and Geometry, 2.2. Cloth behaviour, 2.3. Rendering, 2.4. Interaction with environment, 2.5. From cloth to garment), 3. Building a Simulation System (with sub-items: 3.1. Important laws, 3.2. Simulation Loop). Below the table of contents is the 'Historical Background' section, which contains a list of bullet points: 'In mid 1980's, researchers in computer graphics became interested in modelling cloth in order to include it in the 3D computer generated images and films.', 'In early films involved virtual humans and clothes were simulated as 'part' of body, NOT as a separate entity.', 'In computer graphics, only the *macroscopic* properties of cloth surface were considered.', 'In textile engineering however we have the detailed/precise information of textile materials and computer graphics provide framework for animation and visualization.', 'One of the early 3D CAD systems for clothing were demonstrated by *Hinds and McCartney* in 1990 from Queen's University UK.' At the bottom right, there is a small image showing a 3D CAD simulation of a garment on a virtual human model.

3D CAD Simulation

3D Virtual Model

- Virtual Human Model
- Material Characterization
- 3D data presentation
- Scanning Technology
- Interactive Quiz sections
- Wiki Interactions

The screenshot displays the ICT-TEX Project platform interface. The top navigation bar includes the ICT-TEX logo and the text "ICT-TEX Project platform". The user's name, "Hassan Saeed", is visible in the top right corner. The main content area is divided into three columns. The left column is a sidebar menu with the following items: 3D CAD (highlighted), Participants, Badges, Competencies, Grades, General, Introduction and Historical Background of 3D CAD, 3D Virtual Human Model, Virtual Fit simulation in CLO 3D, Materials for Teacher, Topic 5, Dashboard, Site home, Calendar, Private files, Content bank, My courses, ICT-TEX Documents, Moodle workshop, Apparel production, ICT II, 2D-CAD-PM, and 3D CAD (highlighted). The middle column shows the course content for "Introduction and Historical Background of 3D CAD". The items listed are: Historical Background, Importance of 3D CAD in Clothing, Self Assessment Quiz, and Discussion Forum. Below this, the "3D Virtual Human Model" section is highlighted with a red box, containing: 3D Data presentation, Virtual Human Model, Material Characterization, Scanning Technology, Self Assessment Quiz, and Discussion Forum. The bottom section is titled "Virtual Fit simulation in CLO 3D" and features a 3D model of a female human figure standing next to a piece of fabric. Below the model, the following items are listed: Installation of CLO 3D (Trial Version), User Interface of CLO 3D, Avatar Customization, 2D Construction in CLO 3D, Fit Simulation, Use of sewing accessories, Kinematic Simulation Modelling, Self Assessment Quiz, and Discussion Forum. The right column contains an "Administration" section with options for Course administration, Edit settings, Course completion, Users, Filters, Reports, Gradebook setup, Badges, Backup, Restore, Import, Reset, Question bank, and Recycle bin.

3D CAD Simulation

3D Virtual Model

- **Virtual Human Model**
- **Material Characterization**
- **3D data presentation**
- **Scanning Technology**
- **Interactive Quiz sections**
- **Wiki Interactions**

The screenshot displays the ICT-TEX Project platform interface. The top navigation bar includes the ICT-TEX logo and the text 'ICT-TEX Project platform'. The user's name, 'Hassan Saeed', is visible in the top right corner. The main content area is titled '3D CAD Simulation' and includes a breadcrumb trail: 'Dashboard / My courses / 3D CAD / 3D Virtual Human Model / 3D Data presentation / 3D Data Presentation / View'. A search bar is located in the top right of the main content area. The left sidebar contains a list of course topics, with '3D Virtual Human Model' highlighted. The main content area shows a '3D Data presentation' section with a 'View' tab selected. Below the tab, there is a user selection dropdown set to 'Hassan Saeed' and a 'Printer-friendly version' link. A 'TABLE OF CONTENTS' section lists seven items, each with an '(edit)' link: 1. Introductory Video, 2. Point Cloud, 3. Polygonization, 4. Polynomial Curves, 5. Polygon surface or Polynom surface, 6. NURBS (with sub-items 6.1. Bezier Curve, 6.2. B-spline curve, 6.3. B-spline or Bezier Curve), and 7. Reverse Engineering in Clothing CAD. Below the table of contents, there is a video player for 'Introductory Video' showing a 3D model of a human head. The 'Point Cloud' section follows, with an '(edit)' link and a list of bullet points: 'After a 3D body scan, huge amount of point data is available which is also called 'point cloud'. Point cloud is referred to the position of point in three dimensional space.', 'During a 3D scan of anatomical object, these generated point cloud can be tens of thousands.', 'This turns out to be a large amount of data requires software solutions to process them efficiently.', and 'Data format ist in ASCII format.'

3D CAD Simulation

3D Virtual Model

- Interactive Quiz sections
- Discussion Forums
- Wiki Interactions

The screenshot displays the ICT-TEX Project platform interface. The top navigation bar includes the platform name and user information. The left sidebar contains a menu with categories like '3D CAD', 'Participants', 'Badges', 'Competencies', 'Grades', 'General', and 'My courses'. The main content area is divided into sections: 'Introduction and Historical Background of 3D CAD', '3D Virtual Human Model', and 'Virtual Fit simulation in CLO 3D'. The '3D Virtual Human Model' section lists various topics, with 'Self Assessment Quiz' highlighted by an orange circle. The 'Virtual Fit simulation in CLO 3D' section features a 3D model of a female figure and a list of related topics. The right sidebar shows an 'Administration' panel with options for course management, user management, and reporting.

Course: 3D CAD Simulation | platform.ict-tex.eu | https://www.3dbodyscanning.org/cap/papers/2011/11043_09hlaing.pdf

ICT-TEX Project platform | Hassan Saeed

3D CAD

- Participants
- Badges
- Competencies
- Grades
- General
- Introduction and Historical Background of 3D CAD
- 3D Virtual Human Model
- Virtual Fit simulation in CLO 3D
- Materials for Teacher
- Topic 5

3D CAD

- Dashboard
- Site home
- Calendar
- Private files
- Content bank
- My courses
- ICT-TEX Documents
- Moodle workshop
- Apparel production
- ICT II
- 2D-CAD-PM
- 3D CAD**

Introduction and Historical Background of 3D CAD

- Historical Background
- Importance of 3D CAD in Clothing
- Self Assessment Quiz
- Discussion Forum

3D Virtual Human Model

- 3D Data presentation
- Virtual Human Model
- Material Characterization
- Scanning Technology
- Self Assessment Quiz**
- Discussion Forum

Virtual Fit simulation in CLO 3D

- Installation of CLO 3D (Trial Version)
- User Interface of CLO 3D
- Avatar Customization
- 2D Construction in CLO 3D
- Fit Simulation
- Use of sewing accessories
- Kinematic Simulation Modelling
- Self Assessment Quiz
- Discussion Forum

Administration

- Course administration
 - Edit settings
 - Course completion
 - Users
 - Filters
 - Reports
- Gradebook setup
 - Badges
- Backup
- Restore
- Import
- Reset
- Question bank
- Recycle bin

3D CAD Simulation

3D Virtual Model

- **Videos**

3D CAD Simulation

Virtual Fit Simulation in CLO 3D

- CLO 3D software -> Free for one month
- Installation
- User Interface
- Avatar Customization
- 2D Construction in CLO 3D
- Fit Simulation
- Sewing Accessories
- Kinematic Simulation

The screenshot displays the ICT-TEX Project platform interface. The top navigation bar includes the logo and the text "ICT-TEX Project platform". The left sidebar contains a menu with categories like "3D CAD", "Participants", "Badges", "Competencies", "Grades", "General", "Introduction and Historical Background of 3D CAD", "3D Virtual Human Model", "Virtual Fit simulation in CLO 3D", "Materials for Teacher", "Topic 5", "Dashboard", "Site home", "Calendar", "Private files", "Content bank", "My courses", "ICT-TEX Documents", "Moodle workshop", "Apparel production", "ICT II", "2D-CAD-PM", and "3D CAD". The main content area is divided into sections: "Introduction and Historical Background of 3D CAD" with sub-items like "Historical Background", "Importance of 3D CAD in Clothing", "Self Assessment Quiz", and "Discussion Forum"; "3D Virtual Human Model" with sub-items like "3D Data presentation", "Virtual Human Model", "Material Characterization", "Scanning Technology", "Self Assessment Quiz", and "Discussion Forum"; and "Virtual Fit simulation in CLO 3D" (highlighted with a red border) with sub-items like "Installation of CLO 3D (Trial Version)", "User Interface of CLO 3D", "Avatar Customization", "2D Construction in CLO 3D", "Fit Simulation", "Use of sewing accessories", "Kinematic Simulation Modelling", "Self Assessment Quiz", and "Discussion Forum". The right sidebar shows "Administration" options such as "Course administration", "Edit settings", "Course completion", "Users", "Filters", "Reports", "Gradebook setup", "Badges", "Backup", "Restore", "Import", "Reset", "Question bank", and "Recycle bin".

3D CAD Simulation

Virtual Fit Simulation in CLO 3D

- Use of Videos and step by step instruction and interactive image instructions in platform



3D CAD Simulation

Virtual Fit Simulation in CLO 3D

- Use of Videos and step by step instruction and interactive image instructions in platform



3D CAD Simulation

Virtual Fit Simulation in CLO 3D

- **Use of Videos and step by step instruction and interactive image instructions in platform**

3D CAD Simulation

Discussion Forums, Quiz, WIKI Interactions

- Each course section has its own discussion forum, interactive quizzes and wiki interactions

The screenshot displays the ICT-TEX Project platform interface. The main content area is divided into three sections, each with a list of items and checkboxes:

- Introduction and Historical Background of 3D CAD:** Includes "Historical Background", "Importance of 3D CAD in Clothing", "Self Assessment Quiz", and "Discussion Forum".
- 3D Virtual Human Model:** Includes "3D Data presentation", "Virtual Human Model", "Material Characterization", "Seaming Technology", "Self Assessment Quiz", and "Discussion Forum".
- Virtual Fit simulation in CLO 3D:** Includes "Installation of CLO 3D (Trial Version)", "User Interface of CLO 3D", "Avatar Customization", "2D Construction in CLO 3D", "Fit Simulation", "Use of sewing accessories", "Kinematic Simulation Modelling", "Self Assessment Quiz", and "Discussion Forum".

The "Self Assessment Quiz" and "Discussion Forum" items in each section are highlighted with red boxes. The right sidebar shows "Administration" options such as "Edit settings", "Course completion", "Users", "Filters", "Reports", "Gradebook setup", "Badges", "Backup", "Restore", "Import", "Reset", "Question bank", and "Recycle bin".

3D CAD Simulation

Discussion Forums, Quiz, WIKI Interactions

- Each course section has its own discussion forum, interactive quizzes and wiki interactions

This screenshot shows the course page for '3D CAD Simulation' on the ICT-TEX Project platform. The left sidebar contains navigation options like 'Participants', 'Badges', 'Competencies', and 'Grades'. The main content area is divided into sections: 'Introduction and Historical Background of 3D CAD', '3D Virtual Human Model', and 'Virtual Fit simulation in CLO 3D'. Each section has a list of sub-topics with checkboxes. In the '3D Virtual Human Model' section, 'Self Assessment Quiz' and 'Discussion Forum' are highlighted with an orange box. Below this, there is a 3D model of a female figure and a white t-shirt.

This screenshot shows the course page for '3D CAD Simulation' on the ICT-TEX Project platform. The left sidebar contains navigation options like 'Participants', 'Badges', 'Competencies', and 'Grades'. The main content area is divided into sections: 'Introduction and Historical Background of 3D CAD', '3D Virtual Human Model', and 'Virtual Fit simulation in CLO 3D'. Each section has a list of sub-topics with checkboxes. In the '3D Virtual Human Model' section, 'Self Assessment Quiz' and 'Discussion Forum' are highlighted with an orange box. Below this, there is a 3D model of a female figure and a white t-shirt.

This screenshot shows the course page for '3D CAD Simulation' on the ICT-TEX Project platform. The left sidebar contains navigation options like 'Participants', 'Badges', 'Competencies', and 'Grades'. The main content area is divided into sections: '3D CAD Simulation', '3D Data presentation', and '3D Data Presentation'. In the '3D Data presentation' section, the 'Comments' button is highlighted with an orange box. Below this, there is a 'TABLE OF CONTENTS' section with a list of topics and a video player for an 'Introductory Video' showing a 3D point cloud of a blue object.

3D CAD Simulation

Material for Teachers

- Material is made available for teachers for each course sections which will help them to create better understanding of 3D CAD.
- This material is accessible only for teachers.
- The teaching material will be kept up-to-date

The screenshot displays the ICT-TEX Project platform interface. The top navigation bar includes the platform name and user information. A left sidebar contains a menu with categories like '3D CAD', 'Participants', 'Badges', 'Competencies', 'Grades', 'General', 'Introduction and Historical Background of 3D CAD', '3D Virtual Human Model', 'Virtual Fit simulation in CLO 3D', 'Materials for Teacher', and 'Topic 5'. Below this is a secondary menu with 'Dashboard', 'Site home', 'Calendar', 'Private files', 'Content bank', 'My courses', 'ICT-TEX Documents', 'Moodle workshop', 'Apparel production', 'ICT II', '2D-CAD-PM', and '3D CAD' (highlighted).

The main content area shows a course overview for 'Virtual Fit simulation in CLO 3D'. It features a 3D model of a female avatar and a white t-shirt. Below the model is a list of course activities, each with a checkmark: 'Self Assessment Quiz', 'Discussion Forum', 'Installation of CLO 3D (Trial Version)', 'User Interface of CLO 3D', 'Avatar Customization', '2D Construction in CLO 3D', 'Fit Simulation', 'Use of sewing accessories', 'Kinematic Simulation Modelling', 'Self Assessment Quiz', and 'Discussion Forum'.

A 'Materials for Teacher' section is highlighted with an orange border. It lists three materials, each with a checkmark and a 'Hidden from students' label:

- Introduction and Historical Background of 3D CAD_Material for Teachers
- 3D Virtual Human Model_Material for Teachers
- Virtual Fit simulation in CLO 3D_Material for Teachers

Each material entry includes a description: 'The content is available **only** for teachers and is to be used exclusively as helping material for teaching purposes.'

3D CAD Simulation

Summary

- Development of new graphical illustrations for the courses
- Use of explanatory videos with instructions
- Use of Interactive images
- Discussion Forum and WIKI Interactions
- Interactive quizzes
- Up-to-date teaching material for teachers
- Though the courses are made available but to make best use of online Moodle Platform, it should be always updated new research is taking place and should be made available to it's learners.

THANKS FOR YOUR ATTENTION

Contact:

Dr. Hassan Saeed

hassan.saeed@tu-dresden.de

Prof. Dr. Yordan Kyosev

yordan.kyosev@tu-dresden.de