



Developing Innovative and Attractive CVET programmes in industrial shoe production

Curriculum
Germany

IO 4

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Website: www.dia-cvet.eu

Editor: Andreas Saniter

Authors: DE: Sabina Krebs, Tatjana Hubel (PFI Pirmasens);
Klaus Ruth, Andreas Saniter, Vivian Harberts (ITB);
PT: Rita Souto, Cristina Marques (CTCP), Fátima Martins,
Ricardo Sousa (CFPIC), André Fernandes (CARITÉ);
RO: Aura Mihai, Bogdan Sarghie, Arina Seul (TU Iasi).

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1 Design

Topic	Content	Proposed duration (days)	Mode
SWOT and market analysis	Positioning and strategy development, risks and opportunities	0,5	On site
Benchmarking	Comparative analysis of market position, competitive analysis	0,5	On site
Product concept	Defining the target group, new product concepts or expansion of the target group, creation of a product concept	1	On site
Production planning	Capacity planning, investment and budget planning, distribution control, Contribution margin	1	On site
Collection development	Methodology design process, specifications, aspects: Consumer demand, impact, Benefits, appearance, durability, colors or materials, design, sample production / prototyping, collection, functionality test, presentation	1	On site
Moodboard	Work tools and presentation tools	0,5	On site
Virtual collection	Photoshop 2D / 3D Rendering	1	On site

Excursions	Content	Proposed duration (days)	Mode
Excursions	Transparent shoe factory, shoe museum, material manufacturer	0,25 0,25 0,5	On site

Assessment method Learning success	Content	Mode
Discussion	Recap, Teaching content and conclusions Evaluation scheme	On site, end of course, 0,5 days
Questionnaire	Suggestions for improvement	End of course

Materials
See Trainer Manual Design
Hale, J., O'Connell, A., Lewis, R., Carré, M. J., & Rongong, J. A. (2021). An evaluation of shoe tread parameters using FEM. <i>Tribology International</i> , 153, 106570.
Motawi, W. (2021) <i>How shoes are made</i> (Vol. 1). Walid Motawi.
Motawi, W. (2015) <i>Footwear Pattern Making and Last Design</i> Walid Motawi.
Motawi, W. (2018) <i>Shoe Material Design Guide</i> (Vol. 3). Walid Motawi.
Luximon, A. (Ed.) (2021). <i>Handbook of footwear design and manufacture</i> . Woodhead Publishing.

2 Production Planning

Topic	Content	Proposed duration (days)	Mode
ERP systems	What are ERP systems, ERP systems for the textile sector?	0,5	On site
Industry 4.0.	Introduction, degree of automation, risks and opportunities, status in the footwear industry	0,5	On site
Digitalisation	Digital transformation of various industries, benefits of artificial intelligence (AI), digitalisation of company processes vs. digitalisation of products, individualisation of customer wishes, platform economy/online trade	0,25	On site
Organisation chart - company structure	Hierarchies, positions, departments, tasks and management responsibilities	0,25	On site
The following topics under workflow			
Product data management	Classification of articles, sizes, models, variants, design, target market, materials, components, technical instructions, etc.	1	On site
Order processing	Inventories, production and delivery planning according to deadlines and available resources	1	On site
Production planning and monitoring	Planning and coordination of all production phases as well as tracking of orders and consumptions	1	On site
Material and component planning and inventory management	Ordering materials and components for production orders, invoice management, inventory management	1	On site
Delivery and management of stock of finished goods:	Plan, organize and track all logistics and supply chain activities	0,5	On site
Human resource management	Ensure that sufficient personnel are available to process the production orders; track daily working time and productivity	0,5	On site

Excursions	Content	Proposed duration (days)	Mode
Excursions	PSP Logistik, Ring Maschinenbau	0,25 0,25	On site

Assessment method Learning success	Content	Mode
Discussion	Recap, Teaching content and conclusions Evaluation scheme	On site, end of course, 0,5 days
Questionnaire	Suggestions for improvement	End of course

Materials
see Trainer Manual Production planning
Zangiacomi, Andrea, et al. "Process planning and scheduling for mass customised shoe manufacturing." <i>International Journal of Computer Integrated Manufacturing</i> 17.7 (2004): 613-621.
Fung, Y. N., Chan, H. L., Choi, T. M., & Liu, R. (2021). Sustainable product development processes in fashion: Supply chains structures and classifications. <i>International Journal of Production Economics</i> , 231, 107911.
Wen, X., Choi, T. M., & Chung, S. H. (2019). Fashion retail supply chain management: A review of operational models. <i>International Journal of Production Economics</i> , 207, 34-55. https://www.researchgate.net/publication/328711222_Fashion_Retail_Supply_Chain_Management_A_Review_of_Operational_Models
Muthu, S. S. (Ed.). (2020). <i>Leather and Footwear Sustainability: Manufacturing, Supply Chain, and Product Level Issues</i> . Springer Nature.
Schuh, G., & Stich, V. (Eds.). (2012). <i>Produktionsplanung und-steuerung 1: Grundlagen der PPS</i> . Springer-Verlag.
Kim, Min-Gyu, et al. "Robot-based Shoe Manufacturing System." <i>2018 18th International Conference on Control, Automation and Systems (ICCAS)</i> . IEEE, 2018.

3 Technical Development

Topic	Content	Proposed duration (days)	Mode
Last	Moulding development/wood mouldings/production mouldings/plastic, metal, properties, closure type, net to gross construction mouldings	2	On site
Last copy	Changing of the 3D surface of the moulding to 2D basis for basic model	1	On site
Basic model	Additions to the last copy result in the basic model outline. Model section is inserted in the basic model. Detailing creates the individual parts of the section	1	On site
Rapid Prototyping	Is the first physical output of the sole after 3D construction	0,25	On site
Models	Sole and maquette are joined together, model can be physically assessed for the first time > Approval	2	On site
Sample	Production of samples and patterns as true to production as possible	2	On site
Makes	The most common types of manufacture such as Ago, Strobel, California, Moccasin, Flexible, GoodYear, Opanke, etc.	1	On site
Shaft construction	Joining of the individual parts to the upper, different variations depending on the type of construction.	1	On site
Base construction	Insole, cover sole, insole, outsole, heels	2	On site

Excursions	Content	Proposed duration (days)	Mode
Excursions	Transparent shoe factory, Shoe museum, PSA shoes (Seibel)	0,25 0,25 0,5	On site

Practice	Content	Proposed duration (days)	Mode
Shoe making	Practice different methods of constructions	5	On site

Assessment method Learning success	Content	Mode
Discussion	Recap, Teaching content and conclusions Evaluation scheme	On site, end of course, 0,5 days
Questionnaire	Suggestions for improvement	End of course

Materials

see Trainer Manual technical development

Hale, J., O'Connell, A., Lewis, R., Carré, M. J., & Rongong, J. A. (2021). An evaluation of shoe tread parameters using FEM. *Tribology International*, 153, 106570.

Blattner, M. (2009). Everything about shoes. Lüdin AG.

Motawi, W. (2021) *How shoes are made* (Vol. 1). Walid Motawi.

Motawi, W. (2015) *Footwear Pattern Making and Last Design* Walid Motawi.

Motawi, W. (2018) *Shoe Material Design Guide* (Vol. 3). Walid Motawi.

Luximon, A. (Ed.) (2021). *Handbook of footwear design and manufacture*. Woodhead Publishing.

4 Sustainability Management

Topic	Content	Proposed duration (days)	Mode
Fundamentals of sustainability	Definition, models	1	On site
Standardization and certification	National and international standardization, quality management systems, environmental management systems	0,5	On site
Ecological and social perspectives	Conventions, initiatives	1	On site
Legislation and policy	National, European and international markets, authorities and regulatory issues	1	On site
Media and public perception	Green marketing, greenwashing, success stories and failures	1	On site
Corporate Social Responsibility (CSR)	Definition and scope, CSR strategies	0,5	On site
Toxins, pollutants and metrics	REACH, Greenhouse Gas Protocol, CO2 footprint	1	On site
Sustainable materials and components for footwear	Plastics, leather, eco-labelling and environmental certification. Contrasting manufacturing of materials versus durability	1	On site
Eco-design	Design for manufacture, design for recycling, material selection and cutting for least possible waste/consumption.	0,5	On site
Sustainable packaging for footwear	Key challenges, reusable and recyclable packaging	0,5	On site
Sustainable manufacturing for footwear	Production Planning	0,5	On site
Supply chain and logistics for footwear	Logistics and transport	0,5	On site

Excursions	Content	Proposed duration (days)	Mode
Excursions	e.g. local shoe manufacturer, leather goods supplier or recycling station	0,5	On site
Guest speaker	e.g. a textile company about its sustainability concept, its supply chain management and its recycling strategy	0,5	Online

Practice	Content	Proposed duration (days)	Mode
Case study	Analyze and compare the sustainability strategies of two or three apparel companies.	0,5	Homework
Case study	Analysis of sustainability efforts in own company/development of a CRS strategy.	0,5	On site, group work

Assessment method Learning success	Content	Mode
Discussion	Recap, Teaching content and conclusions Evaluation scheme	On site, end of course, 0,5 days
Questionnaire	Suggestions for improvement	End of course

Material
see Trainer Manual Sustainability management
17 UN Sustainability Goals https://sdgs.un.org/
OECD Due Diligence Guidance for Responsible Supply Chains in the Garment & Footwear Sector https://www.oecd.org/industry/inv/mne/responsible-supply-chains-textile-garment-sector.htm
EU Commission EU strategy for sustainable and circular textiles https://ec.europa.eu/environment/strategy/textiles-strategy_en
DIN EN ISO 14001:2015 https://www.umweltbundesamt.de/themen/wirtschaft-konsum/wirtschaft-umwelt/umwelt-energiemanagement/iso-14001-umweltmanagementsystemnorm
„Eco-Management and Audit Scheme“ – EMAS https://www.umweltbundesamt.de/themen/wirtschaft-konsum/wirtschaft-umwelt/umwelt-energiemanagement/emas-umweltmanagement-guetesiegel-der-europaeischen#systematisches-umweltmanagement-mit-emas https://ec.europa.eu/environment/emas/index_en.htm
DIN EN ISO 26000 – 2021 https://www.bmas.de/SharedDocs/Downloads/DE/Publikationen/a395-csr-din-26000.pdf;jsessionid=4D13AB08B49ABEEC351806FA3187FF75.delivery2-master?__blob=publicationFile&v=1 https://ec.europa.eu/environment/emas/pdf/factsheets/EMASFactsheet_ISO26000.pdf https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100258.pdf
DIN EN ISO 9001 - 2015
CSR in Deutschland https://www.csr-in-deutschland.de/DE/CSR-Allgemein/csr-allgemein.html
Step2Sustainability https://step2sustainability.ctcp.pt/pag.asp?idp=130&op=0

5 STEM

Topic	Content	Proposed duration (days)	Mode
Automation and Robots	Basics, robots and people, types of robots, functionality, programming, existing automation processes in industry.	0,5	On site
3D Printing - Additive Manufacturing	Different techniques e.g. Stereolithography, Fused Deposition Moulding, Selective Laser-Sintering, Selective Laser-Melting, Material Beam Process, Binder Jetting, Print Preparation, Problems and Challenges	0,5	On site
Machine Vision	Basics, key components (light, lens, camera sensor), image processing, recognition of barcodes and QR codes, colour control, area measurement, defect detection, position recognition, augmented reality	0,5	On site
Artificial Intelligence	Automation, digitalisation, image processing, data processing	0,25	On site
Sensors	Basics, measurement parameters, measurement methods, local sensors, mobile sensors, sensors in shoes, evaluations	0,25	On site
Anatomy and Biomechanics	Locomotor system, foot anatomy, development with age, gait, forces, pressures, measurement methods	0,5	On site

Practice	Content	Proposed duration (days)	Mode
Measurements in the biomechanics laboratory	Foot measurements (blueprint, caliper, scanner). Gait analyses, application of measurement methods (pressure, force, EMG, video)	0,5	On site

Excursions	Content	Proposed duration (days)	Mode
Excursions	Transparent shoe factory, shoe museum, Ring GmbH, DESMA	0,25 0,25 0,5 0,5	On site

Assessment method Learning success	Content	Mode
Discussion	Recap, Teaching content and conclusions Evaluation scheme	On site, end of course, 0,5 days
Questionnaire	Suggestions for improvement	End of course

Materials
see Trainer Manual STEM
Kim, Min-Gyu, et al. (2018) " <i>Robot-based Shoe Manufacturing System</i> ", 18th International Conference on Control, Automation and Systems (ICCAS), IEEE, 2018.
Oliver, Guillermo, et al. (2021), "Towards footwear manufacturing 4.0: shoe sole robotic grasping in assembling operations". <i>The International Journal of Advanced Manufacturing Technology</i> , 114.3, 811-827. https://www.researchgate.net/publication/348705383_Towards_footwear_manufacturing_40_Shoe_ole_robolic_grasping_in_assembling_operations
Dispan, J., & Mendler, L. (2021). „ <i>Branchenanalyse Leder-und Schuhindustrie: Entwicklungstrends und Herausforderungen</i> “ (No. 210). Working Paper Forschungsförderung.
Goonetilleke, R. S. (Ed.). (2012), " <i>The science of footwear</i> ", CRC Press.
Luximon, A. (Ed.). (2021) " <i>Handbook of footwear design and manufacture</i> . Woodhead" Publishing.
Ludwig, O. (2012), „ <i>Ganganalyse in der Praxis: Anwendung in Prävention, Therapie und Versorgung</i> “. Maurer.
Baumgartner, R., Möller, M., & Stinus, H. (2011), „ <i>Orthopädieschuhtechnik</i> “. Maurer.
Platzer, W., & Shiozawa-Bayer, T. (2018), " <i>Taschenatlas der Anatomie Band 1: Bewegungsapparat</i> ", Thieme.