

Zertifikatslehrgang

# SMART MATERIALS

Für eine grünere Industrie



## Übersicht

### Modul 1

10./11.03.2022  
24./25.03.2022

Materials and Additive Manufacturing for a Greener Economy, the Basics  
(24H – 2ECTS)

### Modul 2

07./08.04.2022  
21./22.04.2022

Green Tech Materials

(24H – 2ECTS)

### Modul 3

05./06.05.2022  
19./20.05.2022

Green by Design

(24H – 2ECTS)

### Modul 4

02./03.06.2022  
09./10.06.2022

Emerging Green Tech

(24H – 2ECTS)

### External Speakers / Lecturers

Prof. Dr. B. Assouar, **University of Lorraine, IJL**  
Univ.-Prof. A. Benjeddou, **ISAE-SupMéca**  
Univ.-Prof. A. Bergmann, **TU GRAZ**  
Dipl.-Ing. G. Clément, **External expert**  
Dr. S. Langbein, **External expert**  
Dr. M. Feuchter, **Montan University**  
Dr. L. Hensgen, **Tribotecc**  
G. Hiebler, **GPS Villach**  
Dipl. Ing. H. Lammer, **Wood K Plus**  
DI W. Maat, **External expert**  
DI H. Oberwalder, **BHT-Solutions**  
Dr. H. Ragossnig, **Treibacher**  
Dr.<sup>in</sup> S. Schlögl, **PCCM**

### CUAS Speakers / Lecturers

Dipl.-Päd. P. Amann, BSc.  
MSc. A. Berndt  
FH-Prof. Dr. M. Jungmeier (UNESCO Chair)  
MSc. M. Laux  
FH-Prof. DI Dr. habil. P. Nicolay  
MSc. H. Oberlercher  
FH-Prof. DI Dr. N. Randl  
FH-Prof. DI Dr. F. Riemelmoser, MBA  
BSc. MSc. S. Thaler  
FH-Prof. DI Dr. techn. R. Willmann  
G. Zebedin  
MSc. D. Zettel  
MSc. J. Zwatz

# Module 1 – Materials and Additive Manufacturing for a Greener Economy, the Basics (24H – 2ECTS)

## 10.03.2022 – Fundamentals of materials science and engineering

09:00 – 10:00	Come together, Welcome and Introduction, Round of introductions	All	Seminarraum 10, FH Villach	de
10:00 – 12:00	Course introduction incl. The Physics of Climate Change (in a nutshell!); Materials, Smart Materials and Additive Manufacturing for a greener industry (an introduction)	P. Nicolay	Seminarraum 10, FH Villach	de
13:00 – 15:00 15:15 – 16:15	Fundamentals of materials science and engineering: <ul style="list-style-type: none"> <li>• Polymers, Metals</li> <li>• Ceramics (1Std)</li> </ul>	P. Nicolay H. Ragossnig	Seminarraum 10, FH Villach	de

## 11.03.2022 – Materials selection and Additive Manufacturing techniques

09:00 – 10:00	Materials selection	F. Riemelmoser	Seminarraum 10, FH Villach	de
10:00 – 11:00	Life Cycle Analysis	H. Lammer	Seminarraum 10, FH Villach	de
11:15 – 13:15	(Polymer) and Metal 3D Printing	D. Zettel	Seminarraum 10, FH Villach	de
13:15 – 14:00	Lunch und "Q&A Session" <sup>1</sup>			
14:00 – 16:00	Ceramic 3D Printing	H. Ragossnig	Seminarraum 10, FH Villach	de

## 24.03.2022 – Practical Work

09:00 – 17:00	Polymer 3D Printing	P. Amann	FH Smart Labs Klagenfurt	de
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## 25.03.2022 – Practical Work

09:00 – 17:00	Metal 3D Printing	G. Hiebler	GPS Villach	de
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<sup>1</sup> These sessions are an opportunity to (re)discuss with the lecturers specific topics covered during the course, to ask and/or get answers to specific questions, or to discuss new topics.

## Modul 2 – Green Tech Materials (24H – 2ECTS)

### 07.04.2022 – Ceramics & Composites for a greener economy

09:00 – 12:00	Composites	H. Lammer	Seminarraum 10, FH Villach	de
13:00 – 16:00	Ceramics	H. Ragossnig	Seminarraum 10, FH Villach	de

### 08.04.2022 – 3D printed bio-composites

09:00 – 16:00	3D Printing of Lightweight LFRP <sup>2</sup> composite parts (incl. mechanical characterization)	A. Berndt, M. Laux	Smart Lab Carinthia, T10 & Seminarraum 7, FH-Villach	de
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### 21.04.2022 – Green Tech Materials for Energy Efficiency

09:00 – 11:00	Phase-changing materials for energy storage applications (incl. Lab Tour & demonstration)	S. Thaler	Innovationswerkstatt, T10, FH-Villach	de
11:15 – 12:15	3D Printed Heat Exchangers with improved thermal management capabilities (e.g. built-in cooling channels)	J. Zwatz	Innovationswerkstatt, T10, FH-Villach	de
13:00 – 14:00	Electrochemical Catalysts for H <sub>2</sub> production & storage	L. Hensgen	Innovationswerkstatt, T10, FH-Villach	de
14:00 – 15:00	Process cleaning for liquid and gas flows	L. Hensgen	Innovationswerkstatt, T10, FH-Villach	de
15:15 – 16:15	From supercritical CO <sub>2</sub> to aerogels	P. Nicolay	Innovationswerkstatt, T10, FH-Villach	de

### 22.04.2022 – Self-cleaning & self-healing materials

09:00 – 11:00	Super hydrophobic surfaces and applications (incl. self-cleaning, anti-fouling, and drag-reducing surfaces)	P. Nicolay	Konferenzraum 3.16 c, FH-Villach On-line	de
11:00 – 12:45	Lunch und "Q&A Session"			
13:00 – 16:00	Self-healing materials, to expand the lifetime of manufactured products	S. Schlögl	Konferenzraum 3.16 c, FH-Villach On-line	de

<sup>2</sup> Linen Fiber Reinforced Polymers

## Modul 3 – Green by Design (24H – 2ECTS)

### 05.05.2022 – Better AND greener! (Part 1)

09:00 – 11:00	Generative Design (GD) and Topology Optimization (TO) for lightweight construction: basics, current limitations and perspectives	D. Zettel	EDV-Raum 1, FH-Villach	de
11:15 – 12:15	Biomimetic architectures	S. Thaler	EDV-Raum 1, FH-Villach	de
13:00 – 16:00	Practical work: GD/TO case study <sup>3</sup>	D. Zettel	EDV-Raum 1, FH-Villach	de

### 06.05.2022 – Better AND greener! (Part 2)

09:00 – 10:00	Compliant Mechanisms: a new way to reduce the number of parts in your products, while improving their robustness!	G. Clément	On-line	de
10:00 – 12:00	Soft Actuators & Soft Robots	G. Clément	On-line	de
13:00 – 16:00	Rapid Tooling (i.e. how to use 3D Printing to build your own topology optimized tools, on demand and on site!)	W. Maat	On-line	de

### 19.05.2022 – Smarter AND greener! (Part 1)

09:00 – 11:30	Responsive materials, a Grand Tour (incl. Shape-Memory materials, Thermo-, photo- and piezo-chromic materials; non-Newtonian fluids; piezoelectric materials)	P. Nicolay	PMS, Lavanttal	de
11:00 – 12:30	PMS Tour	A. Schneider	PMS, Lavanttal	de
12:35 – 13:15	Lunch@PMS			
13:15 – 15:00	Shape-memory & super-elastic alloys (incl. practical work with shape-memory actuators)	S. Langbein, A. Czechowicz, P. Nicolay	PMS, Lavanttal Hybrid	de
15:15 – 16:15	3D-printed interlocking mechanisms & 3D-printed shape memory polymers	A. Berndt	PMS, Lavanttal	de

### 20.05.2022 – Smarter AND greener! (Part 2)

09:00 – 12:00	Piezo-based sustainable solutions for autonomous Smart Systems (Adaptive Structures & energy harvesting)	A. Benjeddou	On-line	en
12:00 – 13:00	Lunch und "Q&A Session"			
13:00 – 16:00	Novel manufacturing techniques - contradictions to the circular economy	R. Willmann	On-line	de

<sup>3</sup> Using the following softwares: AutoDesk FUSION, ParaMatters

## Modul 4 – Emerging Green Tech<sup>4</sup> (2,4H – 2ECTS)

### 02.06.2022 – Meta-materials & advanced materials

09:00 – 12:00	Acoustic Meta-Materials and meta-surfaces, for ultra-light & ultra-thin sound-insulation applications	B. Assouar	Seminarraum 10, FH Villach Hybrid	en
13:00 – 15:00	Build stronger AND lighter: Graphene and carbon nano-tubes	P.Nicolay	Seminarraum 10, FH Villach	de
15:00 – 16:00	Build better, build Greener: The future of concrete	N. Randl	Seminarraum 10, FH Villach	de

### 03.06.2022 – Biomaterials, an overview

09:00 – 12:00	Bioplastics & applications	M. Feuchter	Seminarraum 10, FH Villach	de
13:00 – 16:00	Wood, a Smart Material!	H. Lammer	Seminarraum 10, FH Villach	de

### 09.06.2022 – Connected & greener!

09:00 – 10:30	<u>100% passive</u> RFID sensors, for long-term integration & monitoring purposes (incl. practical work with integrated SAW RFID Sensors)	P. Nicolay	Seminarraum 10, FH Villach	de
10:30 – 11:15	Smart solutions based on smart materials: feedback & practical examples	H. Oberwalder	Seminarraum 10, FH Villach	de
11:15 – 12:15	Digitalization as a driver of decarbonization. Practical examples and good practices (incl. Digital Hubs, Distance Learning, Open Labs, Hybrid Symposiums, Hybrid Courses, Delocalized courses...)	G. Zebedin	Seminarraum 10, FH Villach	de
12:15 – 13:00	Lunch		Seminarraum 10, FH Villach	de
13:00 – 16:00	Integrated sensors for IoT and Green Mobility	A. Bergmann	Seminarraum 10, FH Villach	de

### 10.06.2022 – Closure conference, and final examination

09:00 – 10:30	Towards a carbon neutral Europe: goals, regulations, dedicated programs & funding instruments	FFG/KWF	Seminarraum 10, FH Villach	de
10:45 – 13:00	Final examination (Quiz ) (30 min) Feedback Session & next steps (CoP)	P. Nicolay	Seminarraum 10, FH Villach	de
14:00 – 15:00	Zertifikatsverleihung	P. Nicolay	Seminarraum 10, FH Villach	de
15:00 – 16:00	Closure Lecture: "Sustainable management of conservation areas, in Austria"	M. Jungmeier	Seminarraum 10, FH Villach	de

## APPENDIX – Contact Information, lecturers 2022

### External lecturers

Prof. Dr. B. Assouar, **University of Lorraine, IJL**, [badreddine.assouar@univ-lorraine.fr](mailto:badreddine.assouar@univ-lorraine.fr)

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