

# SWEDEN'S KEY AM RESEARCH CENTRES IN THE ARENA

## Education

### ÖREBRO UNIVERSITY

- Courses with contents of AM
- Manufacturing Engineering, MT111G, 7.5 Credits
  - Manufacturing Engineering for MSc in Engineering, MT508G, 9 Credits

### LULEÅ UNIVERSITY OF TECHNOLOGY

- Production Engineering
- Additive Manufacturing
  - Processes
  - Materials
  - Products (design and testing)

### DALARNA UNIVERSITY

- MSc Course: Powder Metallurgy & Additive Manufacturing
- Master thesis supervision

### UPPSALA UNIVERSITY

- Master's program in additive manufacturing
- PhD student course: 3D-printing in biomedical materials
- Courses with contents of AM
- Master and PhD thesis
- Open seminar series on AM-topics

### KTH ROYAL INSTITUTE OF TECHNOLOGY

- MSc, PhD, thesis
- Student projects
- Courses: FMG3920  
MG2044  
MH2100  
MH2101

### UNIVERSITY WEST

Education on advanced Master's level within AM, PhD student training within AM, and various courses on AM for industry.

### KARLSTAD UNIVERSITY

- MSc courses
- MASAM
- LPBF course book

### MID SWEDEN UNIVERSITY

- Additive Manufacturing – B.Sc. in Mechanical Engineering (2020-)
- Additive Manufacturing – M.Sc. In Mechanical Engineering (2023-)

### CHALMERS UNIVERSITY OF TECHNOLOGY

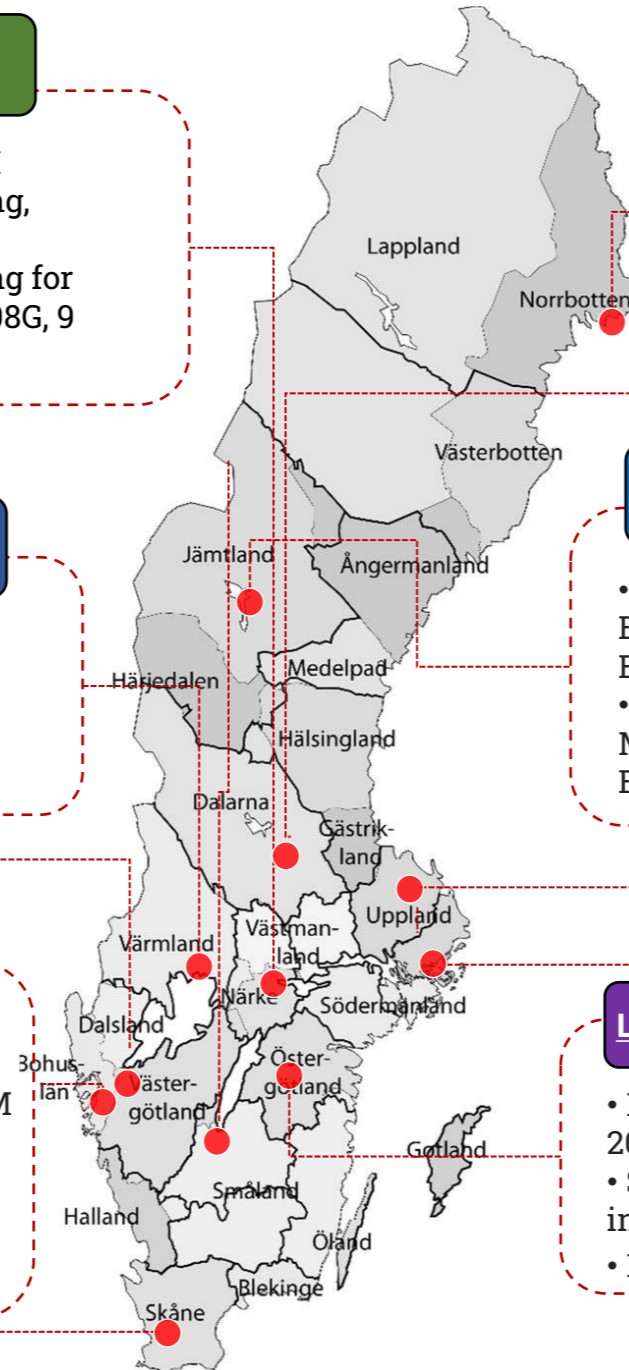
- Largest individual AM courses in Europe
- BSc and MSc course in AM
- Life-long education
- Summer course in AM
- Track course in AM
- Student projects
- Master and PhD thesis

### LUND UNIVERSITY

- Commissioned education on DfAM
- DfAM in several bachelor and master level courses

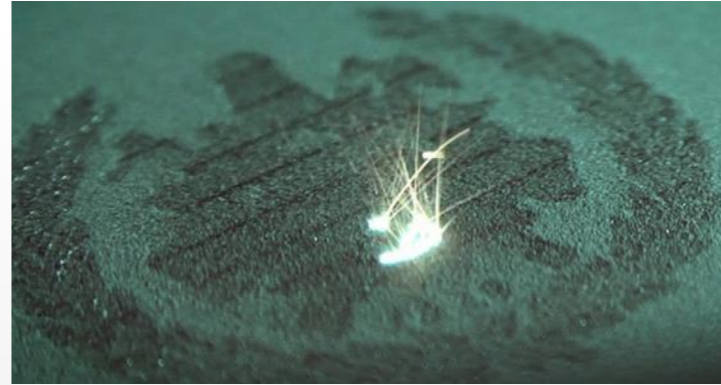
### LINKÖPING UNIVERSITY

- Master course on AM from 2022
- Several advanced courses include AM as a course part
- MSc and PhD thesis



# Chalmers University of Technology

Contact person: Eduard Hryha (hryha@chalmers.se)



## MTT125 - Additive manufacturing

- BSc course, 7.5 credits
- 40 students/year for the Major subject "Mechanical Engineering"
- Examiner: Lars Nyborg
- Aim: to gain knowledge of modern manufacturing with focus on additive manufacturing.
- Contents: pre-processing, product design, process know-how, basic aspects of manufacturing of metallic and polymeric products with respect to materials and processing technologies.

## MTT120 - Additive manufacturing

- Master level course, 7.5 credits
- 70-80 students/year
- Examiner: Eduard Hryha
- Aim: basic understanding regarding additive manufacturing as industrial method for manufacture of advanced parts.
- Contents: pre-processing, product design, process know-how, materials selection and basic aspects of manufacturing of metallic and polymeric products with respect to materials and processing technologies.

## IMS075 - Additive manufacturing

- MSc/BSc level, 5 credits
- Summer course, on-line only, freestanding course
- for the Major subject "Mechanical Engineering"
- Examiner: Lars Nyborg
- Aim: to gain some knowledge on additive manufacturing.

## Other courses with contents of AM

- MMT031 "Manufacturing engineering"  
Powder Metallurgy and Additive Manufacturing included
- LMU234 "Manufacturing engineering"  
Powder Metallurgy and Additive Manufacturing included

## Others

- Largest individual AM courses in Europe
- Life-long education (Production 2030)
- Master/PhD thesis
- Student project, MSC/BS levels

# Dalarna University

Jayaraj Jayamani, [jjy@du.se](mailto:jjy@du.se)



## Course related to AM

- Powder Metallurgy with Additive Manufacturing-GMP2CJ  
Basic level, 7.5 Credits,  
Course in Magister Program in Materials Engineering
- Additiv tillverkning (3D printing)-GMT34A  
Basic level, 7.5 Credits  
Course in Högskoleexamensprogram in Productionstekniker
- 3D-printing översiktscurs-GMT2WL  
Basic level, 7.5 Credits, Free standing course

## Master thesis related to AM

- Microstructure and Micro-Mechanical Characterization of As-built and Heat treated samples of Hastelloy X produced by Laser Powder Bed Fusion Process
- Investigations on microstructural and abrasive wear resistance behavior of additive manufactured high-speed steels
- Mechanical and tribological characterization of additive manufactured Co-free tool steels aimed for cutting tool bodies
- Mechanical and tribological characterization of additive manufactured Co-alloyed tool steels aimed for cutting tool bodies

## Ph.D thesis related to AM

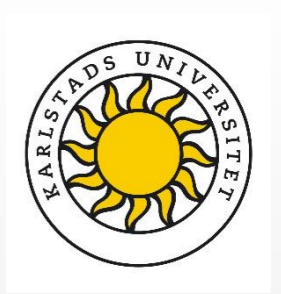
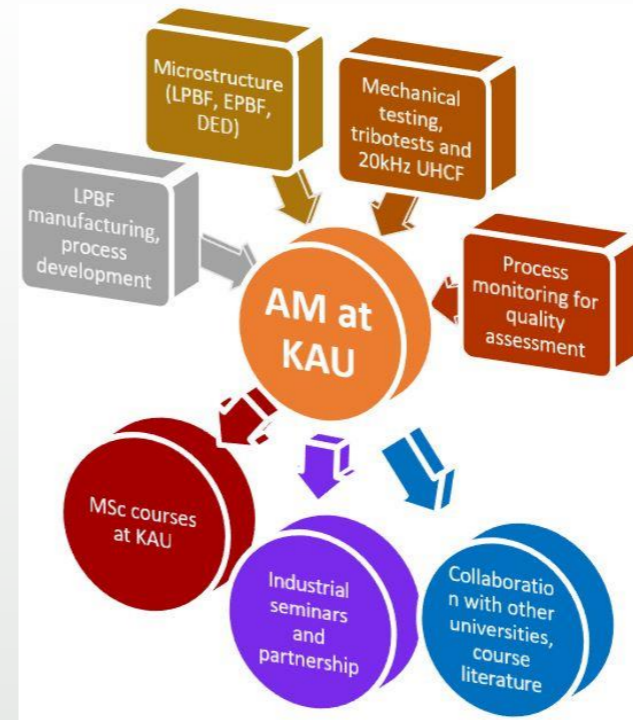
- In-situ alloying based Laser Powder Bed Fusion processing of Ti40Nb alloy (in progress and in collaboration with Tallinn University of Technology, Estonia)

# Karlstad University

Pavel Krakhmalev, pavel.krakhmalev@kau.se

## Courses and related activities

- AM topics (technology, formation of microstructure, basics of DfAM, CAD etc.) are integrated in MSc courses within civilingenjör i maskinteknik and short seminars for industries.
- KAU PhD courses in AM under development
- Participation in MaSAM – Master of Science in Additive Manufacturing KKS-supported project (MIUN, OU, KAU) 2021-2023



**Others (Master/PhD thesis, student project, commissioned education, seminars, books.....)**

2-3 MSc projects in AM yearly since 2019

Course book – “Fundamentals of Laser Powder Bed Fusion of Metals, 1st Edition”

ISBN - Paperback: 978-0-12-824090-8,

ISBN - eBook: 978-0-12-824091-5,

Imprint: Elsevier. <https://www.elsevier.com/books-and-journals/book-companion/9780128240908>



# KTH Royal Institute of Technology

Sasan Dadbakhsh; [sdad@kth.se](mailto:sdad@kth.se)

## FMG3920 Additive processes, materials and design for metallic components 7.5 credits

- PhD level, Held at KTH, 5-15 students, 7.5 HP
- The major aim with the course is to give doctoral students in industrial production, material science, machine design and solid mechanics an interdisciplinary understanding of additive production with a focus on metallic materials. Different design, materials, processing technique and parameter perspectives are given based on different disciplines of teachers and researchers from different departments at KTH.
- <https://www.kth.se/student/kurser/kurs/FMG3920>

## MG2044 Additive Manufacturing 6.0 credits

- Master level, Held, at KTH, 10-30 students, 6.0 HP
- This is a master course to give a specialised knowledge on
  - Technologies and materials for metal additive manufacturing
  - Technologies and material forms for polymer additive manufacturing
  - Post-processing of metals and polymers in additive manufacturing
  - Applications, design considerations and software for additive manufacturing
- <https://www.kth.se/student/kurser/kurs/MG2044?l=en>



## Courses with contents of AM

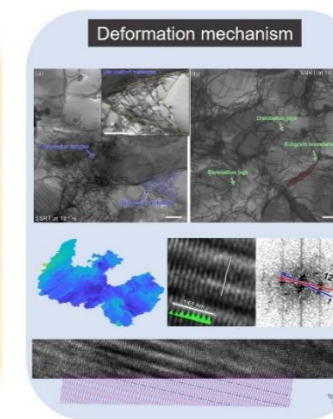
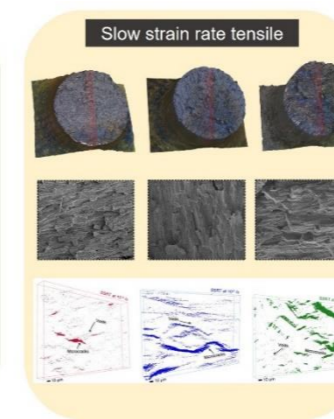
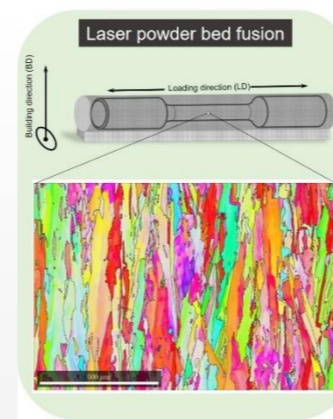
- MG2009 Advanced Manufacturing Technology, 6.0 HP
- MH2101 Metal powder: production, handling and characterisation, 6.0 HP
- MH1022 Fabrication Processes of Metals and Bio Fibres, 7.0 HP
- MH2450 International Seminar in Materials Processes, 6.0 HP
- MH2000 Experimental methods, 6.0 HP
- MH2100 Powder Metallurgy, 6.0 HP

## Others (Master/PhD thesis, student project, commissioned education, seminars, books.....)

Several active departments: production engineering, materials science, machine design, engineering mechanics  
More than 15 completed master's theses  
More than 5 ongoing master's theses projects  
More than 3 completed PhDs  
More than 3 active PhD students  
Regular student projects to help industrial partners

## Course name

- Additive Manufacturing for Industrial Applications, 6 credits (TMKO05)
  - Course level: First cycle
  - Advancement level: G2X
  - In English
  - For program students: EMM, DPU, M, MEC, Mi
  - See study information for more details:  
<https://liu.se/studieinfo/en/kurs/tmko05/ht-2022>
- Introduction to Additive Manufacturing for Professionals, 6 credits (ETE341)
  - Course level: First cycle
  - Advancement level: G1X
  - In Swedish
  - Distance course
  - See study information for more details:  
<https://liu.se/studieinfo/kurs/ete341/ht-2022>
- Additive Manufacturing: Tools, Materials and Methods (TFYA88)
  - <https://liu.se/studieinfo/kurs/tfya88/ht-2022>



## Courses with contents of AM

- TMKO01 Advanced Materials and the Environment
- TMKO02 Materials and Manufacturing Technologies
- TMPS34 Manufacturing Engineering

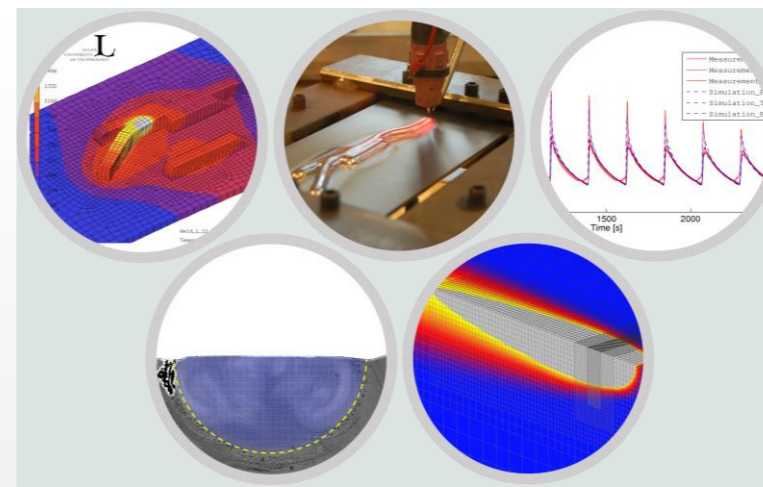
## Others (Master/PhD thesis, student project, commissioned education, seminars, books.....)

On a regular basis we offer Bachelor and Master thesis topics within the field of Additive Manufacturing

PhD thesis

# Luleå University of Technology

Jörg Volpp (jorg.volpp@ltu.se)



## Courses ([www.ltu.se](http://www.ltu.se))

Bachelor level:

- Laser Materials Processing (T0018T)
- Manufacturing Methods (T0019T and T7019T)

Master level

- Additive Manufacturing – Process, Material, Product (T7027T)
- Advanced processing and CyberLab (T7015T)
- Materials Science and Engineering - project course (T7009T)
- SIRIUS – Creative Product Development (M7017T)
- SIRIUS – Applied Product Simulation (M7029T)
- SIRIUS – Integrated Production Development (T7026T)

## Others

LTU continuously supervises Master and PhD projects in the field of Additive Manufacturing in different groups (design, processing, material analysis)

# Lund university/LTH

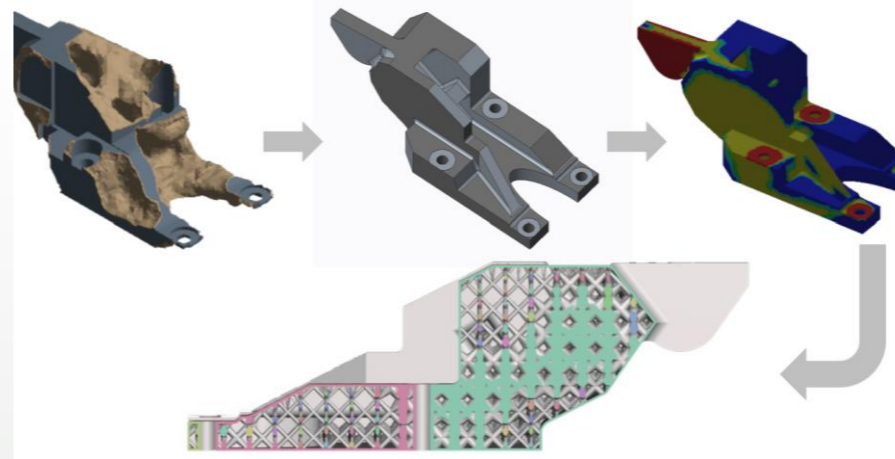
Axel Nordin: axel.nordin@design.lth.se

**Course name** (provide information such as level, Nr of students, program, credits, aims, contents etc)

- Commissioned education on:
  - AM process: from CAD to part
  - Designing for AM
  - Economics of AM
  - Topology optimization
  - Generative Design and AM

**Course name** (provide information such as level, Nr of students, program, credits, aims, contents etc)

- Designer Tools 6 hp, G
- Design for L-PBF in metals and polymers
- Mesh-based design
- Generative design



**LUND**  
UNIVERSITY

## Courses with contents of AM

- Introduction to Workshop Training 6 hp, G
- Designer Tools 6 hp, G
- Product development and Design Methodology 5 hp, G
- Design for X 7,5 hp, A
- Computer based design analysis 7,5 hp, A

## Others (Master/PhD thesis, student project, commissioned education, seminars, books.....)

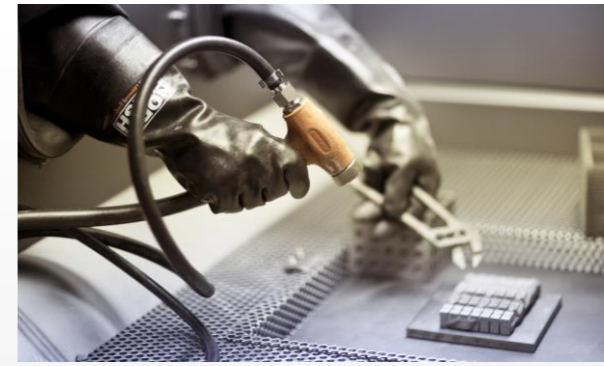
Godec, D., Gonzalez-Gutierrez, J., Nordin, A., Pei, E., & Ureña Alcázar, J. (2022). *A Guide to Additive Manufacturing*. Springer Nature.

Diegel, O., Nordin, A., & Motte, D. (2019). *A practical guide to design for additive manufacturing* Singapore: Springer Singapore.



# MID SWEDEN UNIVERSITY

Lars-Erik Rännar: [lars-erik.rannar@miun.se](mailto:lars-erik.rannar@miun.se)



## Programme:

*Master's Programme (one year), 60 credits, in Additive Manufacturing*

## Courses:

International programme includes courses, at advanced level, focusing on AM, such as:

- Additive Manufacturing in Metal, 7.5 credits
- Additive Manufacturing and Sustainability, 7.5 credits
- Scientific Writing, 7.5 credits
- Materials for Additive Manufacturing, 7.5 credits
- Industrial production, 7.5 credits
- Structural mechanics and thermodynamics, 12 credits
- Design for Additive Manufacturing, 7.5 credits

## Related:

- Above is also given as distance programme, 50% study pace.
- Course package 30 credits, comprising first 4 courses above.
- Master by Research programme to be launched fall 2024.
- Internship courses comprising 7.5 and 30 credits to be launched 2024.

## Programme:

Bachelor of Science programme, 120 credits, "*Additiv tillverkning – högskoleingenjör maskinteknik / Additive Manufacturing - Bachelor of Science in Mechanical Engineering, 180 credits*"

## Courses:

Includes courses, at basic level, focusing on AM such as:

- Additive Manufacturing Technologies, 7.5 credits
- Materials characterization for Additive Manufacturing in metal, 7.5 credits
- Industrial production, 7.5 credits
- Structural mechanics and thermodynamics, 12 credits
- Design for Additive Manufacturing, 7.5 credits

# University West

## Course name

- Additive Manufacturing Processes (ADT610). An advanced course. The course is given for three master programs; TAMST, TATIK and TAPTK. The course is 7.5 credits and covers all the different AM processes, ranging from metals to plastics.
- Additive Manufacturing Processes (ADT110). A bachelor course. The course is given for one program; TGMEC. The course is 7.5 credits and covers all the different AM processes, ranging from metals to plastics.
- Metallurgy of Welding and AM (MTS600). The course covers the materials science behind welding and AM.
- Additiv tillverkning grund - Koncept, begrepp och metoder (AKB110). A bachelor level industry course with 2.5 CP, given in Swedish. 5 weeks, distance with one physical meeting
- Additiv tillverkning - Reparation ATR602. A master level industry course with 2.5 CP, given in Swedish. 5 weeks, distance with one physical meeting.
- Additiv tillverkning (ADTU10). Contract education course with 5 CP on bachelor level.



## Courses with contents of AM

- Advanced Materials Science (AMT601)
- Non-destructive evaluation (OFP600)
- Statistical Process Control & DoE (SPF610)

## Other

Each year there are several master and bachelor thesis (and smaller projects) works conducted related to AM, within different processes and alloy systems.

# Uppsala university

Activities coordinated through **The additive manufacturing initiative at the Ångström laboratory**  
[additive@angstrom.uu.se](mailto:additive@angstrom.uu.se)

Director of initiative: Erik Lewin [erik.lewin@kemi.uu.se](mailto:erik.lewin@kemi.uu.se)

## Master's program in additive manufacturing

- International masters program on additive manufacturing, started 2020. Presently 10~15 students in both years.
- Program description:  
<https://www.uu.se/en/admissions/master/selma/program/?pKod=TAT2M>
- Contact program responsible for more information:  
Prof. Urban Wiklund [urban.wiklund@angstrom.uu.se](mailto:urban.wiklund@angstrom.uu.se)

## BSc, MSc and PhD theses on AM-related topics

- Currently about 15 PhD students at Uppsala university working on AM-related topics. [Published PhD theses found through the university's publication database](#).
- Several master theses per year on engineering masters (Q and K) as well from the dedicated master's programme in AM deal with AM topics. Projects conducted at university, or in industry. [Finished Bachelor and Master thesis are published and found through the university's publication database](#), using the keyword "additive manufacturing".



UPPSALA  
UNIVERSITET

## Under graduate and graduate courses with contents of AM

Many courses within the dedicated master's program, e.g.:

- [Introduction to Additive Manufacturing, 5 ct \(1TM102\)](#)
- [Materials Chemistry for Additive Manufacturing, 5 ct \(1KB233\)](#)
- [Manufacturing of Metal Powders, 5 ct \(1TM104\)](#)
- [Additive Manufacturing in Metallic and Ceramic Materials, 10 ct \(1TM106\)](#)
- [Additive Manufacturing in Polymeric Materials, 5 ct\(1TM105\)](#)
- [Structural Optimisation for Additive Manufacturing I, 5 ct \(1TM103\)](#)
- [Post Processing and Surface Engineering, 5 ct \(1TM125\)](#)
- [Additive Manufacturing in Medicine, 5 ct \(1TM128\)](#)

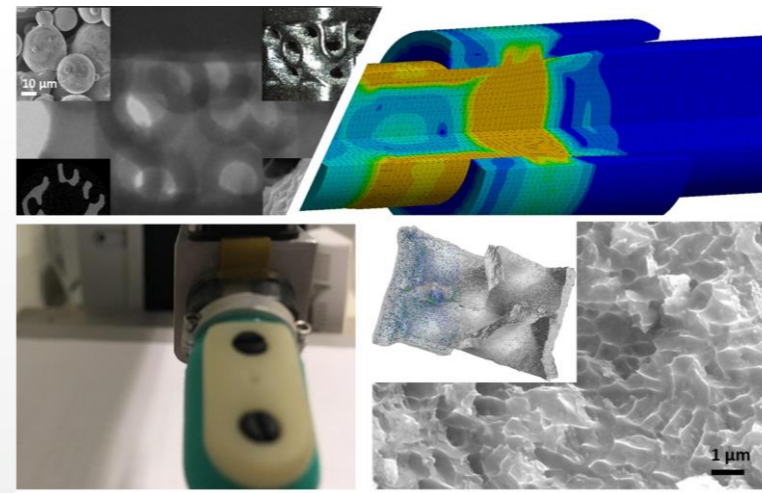
But there is also AM content in courses given at other study programs, e.g. the engineering masters with material focus (Q and K programmes).

## Other

- Open seminar series on AM-topics held since spring 2019  
<https://www.additivemanufacturing.se/seminars/>

# Örebro University

Patrik Karlsson, patrik.karlsson@oru.se



## Courses with contents of AM

- Manufacturing Engineering, MT111G, 7.5 Credits
- Manufacturing Engineering for MSc in Engineering, MT508G, 9 Credits

## Others

Anton Jansson, Only a shadow, PhD thesis 2016

Sebastian Hällgren, Some aspects on designing for metal Powder Bed Fusion, Licentiate thesis, 2017

Amir Reza Zekavat, Application of X-ray Computed Tomography for Assessment of Additively Manufactured Products, PhD thesis, 2019