

Corso: **ADDITIVE MANUFACTURING**

Docente: **PROF.SSA BIANCA MARIA COLOSIMO**
(contribution proff. B. PREVITALI and G. Moroni)

Semestre: **1°**

Lingua di erogazione: **INGLESE**

N° max studenti ammessi: **-**

Modalità d'esame per non frequentanti: **SI**

Note: **CORSO EROGATO DA ALTRA SCUOLA**

Prodotto	Interni	Comunicazione	Fashion	D&E	PSSD
X	X	X	X	✓	X

ADDITIVE MANUFACTURING

Additive Manufacturing (AM), often referred to as 3D Printing, is opening new opportunities for producing customized, light products characterized by highly complex geometries and functionalized surfaces.

The course provide an introduction to the AM processes and their applications, discussing their technical and business-oriented implications for designers, engineers, “makers” and other possible users of this advanced manufacturing technology.

The course specifically introduces AM processes for polymers and metals, discusses challenges and opportunities at the design stage and focuses on zero-defect AM solutions.

Laboratory activities will be held at AddMe.Lab of the Mechanical Engineering Department and allow students to develop hands-on knowledge on specific AM problems.

ADDITIVE MANUFACTURING

CRITERI DI VALUTAZIONE

Grading will be based on oral examination.
An optional team project is possible.

MODALITÀ D'ESAME

Oral exam

Aerospace



TRADITIONAL DESIGN

Source: SAVING project

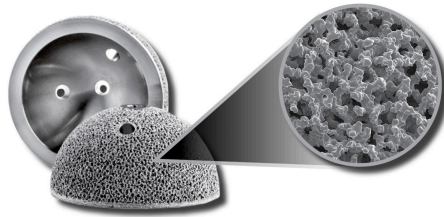


AM OPTIMIZED DESIGN

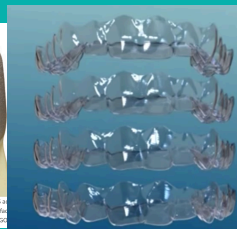
Source: SAVING project



Bio-medical and dental implants



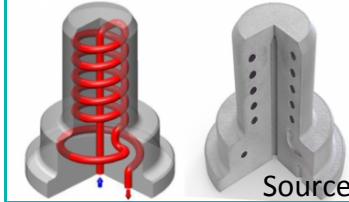
Wires and Cr three-unit bridge manufactured by REGO USA using their EOS manufacturing system. Support anatomy, precise marginal integrity and smooth surface produced consistently from every STL file. Source: REGO



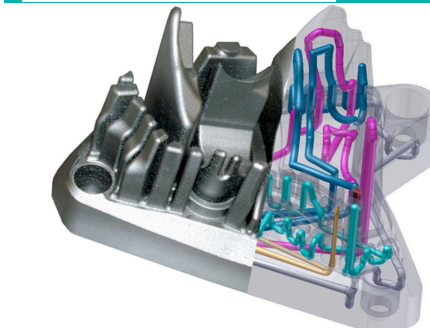
Source: EOS

Source: Invisaling

Tooling and Machinery



Source: EOS



Source: Renishaw.

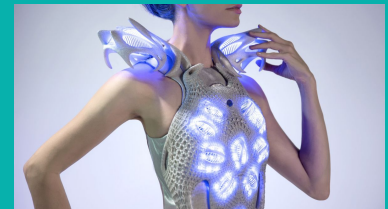
Creative Industries



<https://www.pinterest.com/Printeresting3D/3d-printed-home-decor/>



<http://www.rapidreadytech.com/2014/09/stratasys-collaborates-on-jewelry-line/>



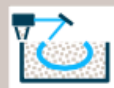
<http://www.wearable.com/>

Additive Manufacturing - Settori industriali interessati

Additive manufacturing technologies

TECHNOLOGY

MATERIALS

TYPICAL
MARKETSRELEVANCE
FOR METAL

Powder bed fusion – Thermal energy selectively fuses regions of a powder bed

Metals, polymers

Prototyping,
direct part



Directed energy deposition – Focused thermal energy is used to fuse materials by melting as the material is deposited

Metals

Direct part,
repair



Sheet lamination – Sheets of material are bonded to form an object

Metals, paper

Prototyping,
direct part



Binder jetting – Liquid bonding agent is selectively deposited to join powder material

Metals, polymers,
foundry sand

Prototyping, direct
part, casting molds



Material jetting – Droplets of build material are selectively deposited

Polymers, waxes

Prototyping,
casting patterns



Material extrusion – Material are selectively dispensed through a nozzle or orifice

Polymers

Prototyping



Vat photopolymerization – Liquid photopolymer in a vat is selectively cured by light-activated polymerization

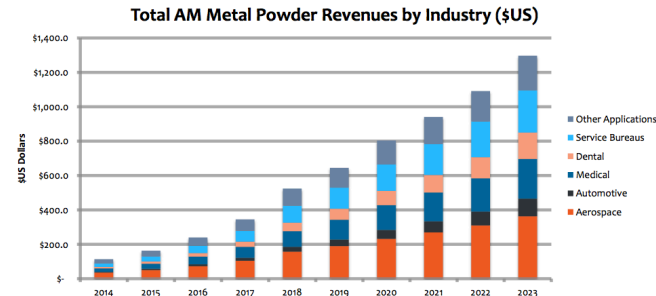
Photopolymers

Prototyping

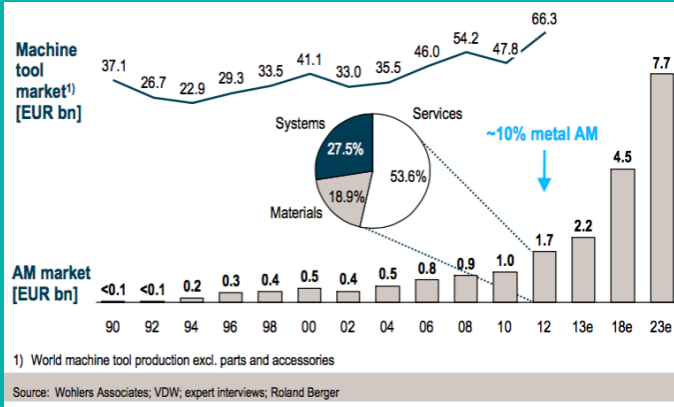


AM technologies for metal objects

Dental, orthopedic implants, and rapid manufacturing of prototypes growing fastest



Source: SmarTech Markets Publishing, *Opportunities in Metal Additive Manufacturing*



AM – crescita mercato

AM – advantages:

- Customization
- Produce when and where needed
- Quick turnaround from design to part
 - Limited need for tooling
 - Design complexity has little impact on costs
- Design flexibility
 - Complex structure optimized for functionality, not producibility
 - Lightweight
 - Improved heat transfer
 - Reverse engineering

