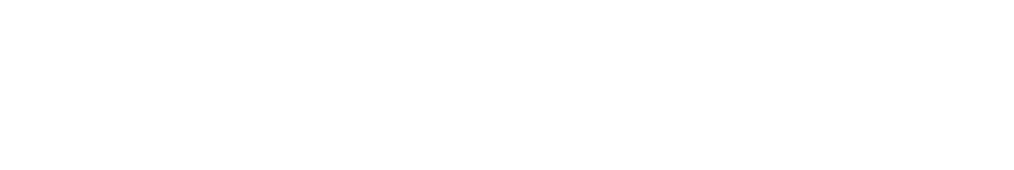


**FRAGE 1 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F1/Lektion 01**



Name the number of the standard for classification of manufacturing processes and the main groups. From what aspect are the manufacturing processes classified in this standard?

Standard: DIN 8580

Main groups: primary shaping, forming, separating, joining, coating, changing of material properties

Classified by cohesion: creation, preservation, reduction, increase



**FRAGE 2 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F1/Lektion 01**



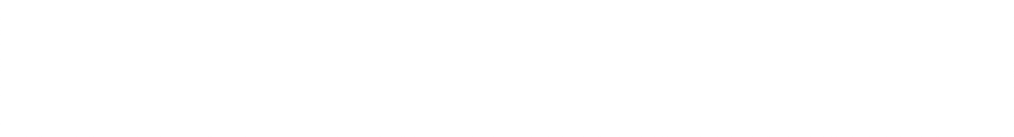
What does manufacturing technology involve?

Manufacturing technology involves the **manufacture of components with defined characteristics, e.g., geometry, dimensions, and material properties,** as well as the **joining of components to form products.**



**FRAGE 6 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F1/Lektion 01**



What are the most important changes in the four industrial revolutions that have taken place up to now?

Industry 1.0: beginning of the machine age with the invention of the steam engine, hydropower, the loom, and the spinning frame

Industry 2.0: introduction of assembly line work (division of labor)

Industry 3.0: computing machines and personal computers, control systems for machines

Industry 4.0: digitalization and networking of production plants, introduction of cyber-physical systems, Internet of Things



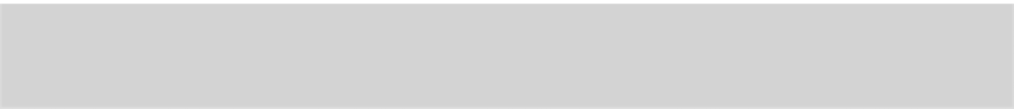
**FRAGE 4 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F1/Lektion 01**



What are the results of a quality improvement?

Increasing productivity, reducing costs, reducing prices, increasing market share, safeguarding the company and jobs



**FRAGE 8 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F1/Lektion 01**



What components do CFRP materials (carbon fiber-reinforced plastics) consist of? What weight reductions are possible?

CFRP fiber composite materials consist of a matrix material (epoxy resin or Duroplasts) and a fiber material (glass or carbon fiber) as a reinforcing material.

With existing manufacturing technologies, weight reductions of up to approx. 30% and cost reductions of approx. 40% can be achieved compared to lightweight metallic structures.



**FRAGE 15 VON 404**

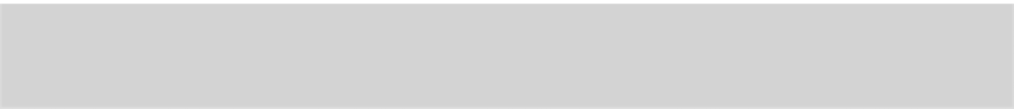
**DLBINGFVI01\_Offen\_schwer\_F1/Lektion 01**

Basic times, allowance times, recovery times



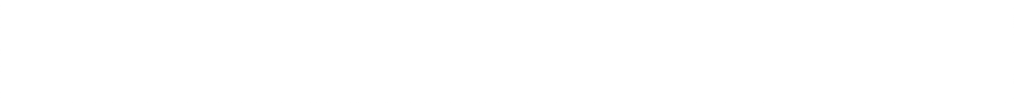
According to REFA, how are production and setup times for the work order time divided? How are these times further subdivided?

Basic times: activity times (influenceable and non-influenceable) and waiting times Allowance times: factual allowance times, personal allowance times



**FRAGE 48 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F1/Lektion 02**



**Briefly explain the “calendering” manufacturing technology.**

In calendering, sheet materials are formed by using rolling. Sheets, panels, etc. are produced. Calendering is widely used in the production of semi-finished plastic products.



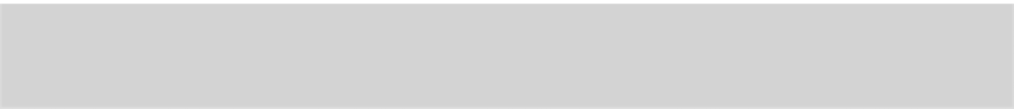
**FRAGE 43 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F1/Lektion 02**



**Name the most important groups of processes for the production of solid bodies by primary forming.**

These are the manufacturing processes for creating cohesion: from a liquid, plastic, or pasty state (casting of metallic and polymeric workpieces), from the solid, granular, or powdery state of metals (powder metallurgy: extrusion and sintering), and by additive manufacturing processes (layer-upon-layer building of components with almost any geometry and metallic and polymeric materials).



**FRAGE 44 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F1/Lektion 02**



**When are casting processes for metallic materials particularly advantageous to use and what problems can arise?**

The casting process is particularly advantageous for the mass production of components. However, problems can arise due to the properties of the components that result from the solidification processes, e.g., shrinkage, blowholes, crystallization, and can only be used to a limited extent with regard to the requirements for strength properties. A particular advantage of the process is that cavities inside the castings can be easily created with the aid of cores.

However, necessary preceding steps in casting technology are pattern and mold making. The costs of pattern and mold making are comparatively high, but they are relativized by the number of components cast.



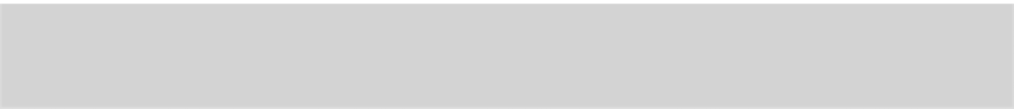
**FRAGE 45 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F1/Lektion 02**



**What should be considered in the design of castings?**

It is of great importance that the casting design is appropriately orientated toward the cast part. Particular care must be taken to avoid areas with large material accumulations, major deviations in wall thicknesses and sharp corners and edges, as well as contours where stresses can occur during solidification. Thus, it is necessary for the component designer and the foundry specialist to work closely together in advance.



**FRAGE 55 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F1/Lektion 02**



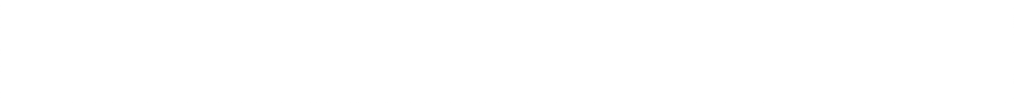
**What two forming processes are fundamentally distinct in forming technology and what are their respective advantages?**

In forming technology, a distinction is made between cold and hot forming processes. At higher temperatures (above the recrystallization temperature, at least), the materials are generally much easier to form and recrystallization occurs simultaneously (with an associated reduction in hardening). Cold forming (at room temperature) requires much higher stresses than hot forming, but has the advantage of a considerable hardening of the materials. In addition, forming technology distinguishes between sheet metal and solid forming.



**FRAGE 59 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F1/Lektion 02**



**Describe the “electrochemical machining”** **removal process**

Electrochemical machining (ECM) is a manufacturing removal process that is also used for particularly hard and difficult-to-machine materials (e.g., in toolmaking for forming dies). The workpiece is placed in an electrolyte and then DC voltage pulses are applied. The workpiece is poled as anode (positive), while the tool is poled as the cathode (negative). The current causes the upper surface of the workpiece to disintegrate. The tool sinks into the workpiece as the surface that comes in contact with the current is removed, meaning that the geometry of the tool is reproduced on the workpiece.



**FRAGE 94 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F1/Lektion 03**



**What are the three main application groups for additive manufacturing processes?**

Additive manufacturing processes have developed rapidly in recent years. In the meantime, the applications are divided into the groups rapid prototyping, rapid tooling, and rapid manufacturing (2 pts. each, max. 6 pts).



**FRAGE 95 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F1/Lektion 03**

In what industries can applications of additive manufacturing processes be found?

Additive manufacturing (AM) users can be found in a wide variety of Industries and applications, including: the automotive, machine manufacturing, aerospace (individual production and small batches), medical technology (dentures, prostheses), consumer products, and jewelry industries. (1 pt. each, max. 6 pts.)



**FRAGE 96 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F1/Lektion 03**



**According to what aspects is the production of components using additive processes carried out?**

The production of components using additive principles is directly carried out on the basis of 3D CAD data with the following important aspects: shaping is undertaken by the addition of material, not the reduction, the material is formless material, construction occurs layer-upon-layer, and no shaping tools are needed. (2 pts. each, max. 8 pts.)



**FRAGE 98 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F1/Lektion 03**



**What materials are most commonly used in stereolithography? Name 6 advantages.**

The most common materials used are curable epoxy resins. (2 pts.) The mechanical properties to be mentioned in particular are high strength, low impact sensitivity, abrasion resistance, high dimensional accuracy, high adhesive strength, and flexibility. Epoxy resins have favorable mechanical properties as well as good electrical insulation properties, and sufficient heat resistance. Acrylic resins are also used since they are considered to be easy to process and have high weather resistance. (6 pts.)



**FRAGE 99 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F1/Lektion 03**



**Explain the stereolithography process.**

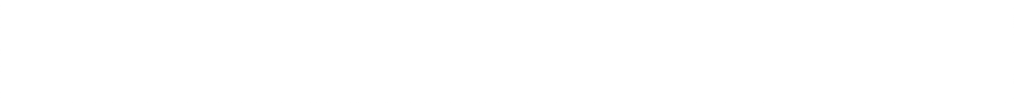
Stereolithography involves the layer-upon-layer construction of a workpiece by crosslinking curable plastics, primarily Duroplasts.

Its essential components are a tank with a liquid photosensitive or a heat-sensitive polymer (generally a Duroplast, e.g., epoxy resin) into which a curing agent (hardener) is mixed, a build platform, which is height-adjustable in increments (approx. 0.05 to 0.3 mm, depending on the application) and is moved downward as the construction progresses. Additional essential components include a laser with X/Y control that supplies the energy required for the chemical reaction of the polymer and a software-controlled mirror that deflects the laser beam in the X/Y direction. In this process, the light curing or heat-curing Duroplast, e.g., epoxy or phenolic resin, is explicitly cured in thin layers by a laser beam using heat or UV light. The component with its three-dimensional structure is created by successively building up the layers. In some cases, supporting structures are necessary and are also built by the laser as ancillary elements since the plastic structure can be comparatively soft, particularly if it requires thin layers.



**FRAGE 104 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F1/Lektion 03**



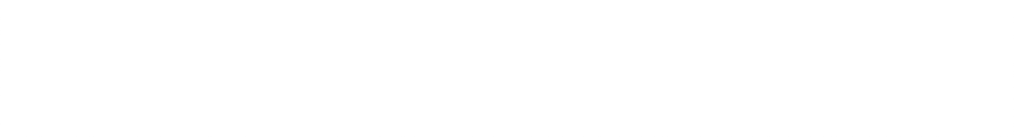
**Explain the 3D printing process principle.**

The 3D printing process is a powder-based process that selectively solidifies powder locally layer-upon-layer. The powder is dispensed onto the build platform in thin layers before a bonding agent is injected into the powder layer with a piezo injector. The effect of the bonding agent turns the powder layer into a solid material, which also bonds with the substrate. Thus, the component is built up layer-upon-layer. The powder, which is not bonded, remains in the build space, stabilizes the component, simultaneously performs a support function, and is available for further building processes.



**FRAGE 118 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F1/Lektion 04**



**For what model types and what corresponding aspects of the model types is rapid prototyping well suited?**

Design model: requires high level of geometric detail and surface quality; ergonomic model: indicates operating functions; functional model: provides functionality for testing implementation. (2 pts. each, max. 6 pts.)



**FRAGE 121 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F1/Lektion 04**



**What additive manufacturing processes are typically used to create prototypes as part of rapid prototyping?**

The prototypes are created using the stereolithography (STL), 3D printing (3DP), and fused deposition modeling (FDM) processes. (2 pts. each, max. 6 pts).



**FRAGE 117 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F1/Lektion 04**



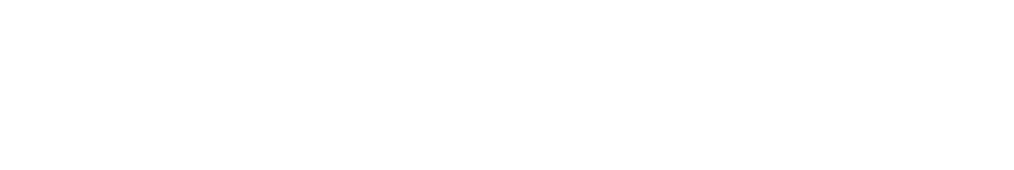
**Where is the greatest significance and most common application area of rapid prototyping?**

The most frequent area of application of rapid prototyping in the early development phase, and the area where it holds the most significance, is the generation of models and prototypes The areas of application are generally found where there is a high degree of complexity in the design. The particular goal here is to balance time and cost, as well as design and functionality. These goals can be achieved with relative ease when using rapid prototyping.



**FRAGE 120 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F1/Lektion 04**



**Why are models produced with 3D printers as part of rapid prototyping well suited for the architecture sector?**

These models serve to present designs to clients and as exhibits, as well as for presentations at trade fairs or exhibitions. Such models of buildings are readily available in the architectural field. By using a model, individual details and their effects can be explained in early phases to protect the project against costly expenses for redesign. This enables design, coordination, and acceptance to be shifted to an earlier phase. Potential planning errors can be identified at an early stage and changes can be initiated in a timely manner.



**FRAGE 119 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F1/Lektion 04**



**For what purposes and in what industries is rapid prototyping used?**

Household and consumer appliances: checking appearance, function, handling; automotive industry: checking maximum design freedom, component interactions, utilization of installation space; aerospace industry: components with optimized designs and extreme loads; aircraft industry: planning, structural design, and interior design in the model making; healthcare: production of prostheses, implants; machine manufacturing: alternative product developments, particularly for complex designs; architecture: checking appearance, geometries, functionalities, and overall appearance of buildings. (1 pt. each, max. 10 pts.)



**FRAGE 122 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F1/Lektion 04**



**Explain in detail why rapid prototyping is particularly well suited for automobile manufacturing.**

The aim of rapid prototyping is to produce a prototype of a component for which a CAD design is available in the shortest possible time. At minimum, the prototype should indicate the geometry of the future component and primarily serve as an illustrative model. In the development of complex designs, such as with the front axle, steering, engine, and transmission in automobiles, the installation space is generally densely packed with a wide variety of design elements. In this case, it helps the designer to build prototypes of the individual components in order to check the utilization of the available space for the design. It is also helpful for the components themselves to be available as 1:1 visual models very quickly after the preliminary completion of a design phase for the components involved in a particular area. This is so their position and independence from each other, even under dynamic movements can be checked.



**FRAGE 131 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F2/Lektion 05**



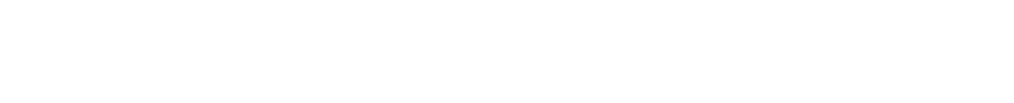
**What do the costs for manufacturing mass-produced injection molds depend on?**

The cost of manufacturing mass-produced injection molds depends on a great number of factors, such as the number of mold cores, the size of the components, the desired surface properties, the number of gates, the geometry of the cooling channels, wear due to injection processes, and many others. The cost of such molds, particularly in large-scale production, is extremely high. (1 pt. each, max. 6 pts).



**FRAGE 130 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F2/Lektion 05**



**What is referred to as a “direct process” in rapid tooling?**

With the direct process, sand molds and sand cores for casting technology can be created in an early phase of development using rapid tooling in order to produce initial casts and, in turn, real cast parts.



**FRAGE 123 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F2/Lektion 05**



**What is the goal of rapid prototyping for manufacturing technology, what are the main applications, and what manufacturing processes are used for this purpose?**

Rapid tooling applies additive processes to generate tools for manufacturing processes. The aim is to produce prototypes within a short period using various processes. This involves tools such as molds and cores made of molding sand for casting technology being produced using 3D printing processes as well as metal injection molds for plastics with the help of selective laser sintering (SLS) or laser beam melting (SLM or SEBM).



**FRAGE 124 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F2/Lektion 05**



**Describe the application of rapid tooling for casting technology (box molding process).**

The application area of rapid tooling in the field of casting technology includes the production of molds and cores from molding sand used in traditional casting technology (box molding process) in order to cast prototypes and initial models. In this process, the 3D printing process (3DP) is used to produce sand molds and sand cores from molding sand that, for example, are used as lost patterns or lost cores. Here, a bonding agent is injected into the sand structure with its respective layer using a print head to build up the strength.



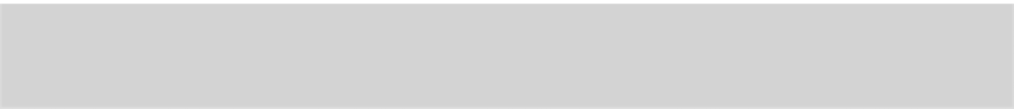
**FRAGE 127 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F2/Lektion 05**



**Explain 5 reasons to use rapid tooling.**

The following reasons illustrate the benefits of the application of rapid tooling: rapid product provision through tools manufactured in a short time (2 pts); short development times for tools (2 pts.); typically uses original series plastic grades (2 pts.); low-cost alternative to conventional toolmaking (2 pts.); suitable for small and medium product series (2 pts.).



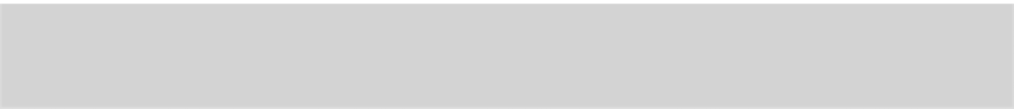
**FRAGE 128 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F2/Lektion 05**



**Why is rapid tooling a suitable process, particularly in the field of automobile manufacturing?**

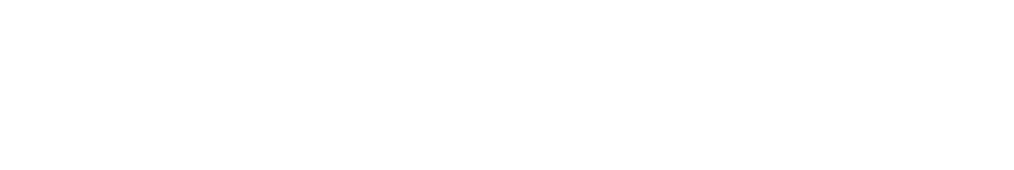
In automobile manufacturing in particular, visual and functional models made from the actual component material are produced in an early phase in engine and transmission design (primarily for aluminum housings). In particular, models for test purposes must be generated at an early stage so they can also be subjected to real loads during testing that are similar to what the future components will have to bear. For the initial tests, executable and loadable motors and gears are needed for testing the drive systems in multiple areas.



**FRAGE 138 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F2/Lektion 06**

Conventional tool-based manufacturing, such as casting, forming, or machining, generally requires an organization in which warehousing and distribution play a significant role. Such forms of organization can usually be designed more independently and ﬂexibly in additive manufacturing. This fact also applies to and the allocation of time and physical resources. By using locally operating additive systems, products can be manufactured anywhere, in any quantity, and distributed locally. (2 pts. per advantage)

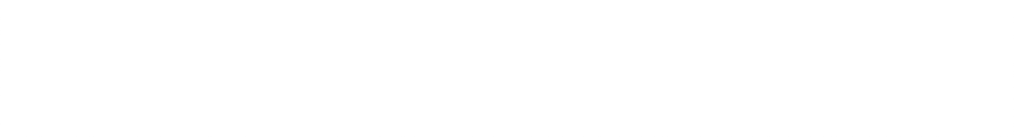


**What advantages do rapid manufacturing processes have compared to conventional manufacturing with regard to organizational aspects (name 3 advantages)?**



**FRAGE 140 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F2/Lektion 06**



**In what application areas or industries can rapid manufacturing be used?**

Areas of application for additive manufacturing can be found in the following industries: machine manufacturing, automotive industry, aircraft manufacturing, aerospace, medical technology, architecture, and toys, etc. (1 pt. each, max. 6 pts.)



**FRAGE 135 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F2/Unit 06**



**What does rapid manufacturing include?**

Rapid manufacturing encompasses a wide range of methods and processes that can be used to produce real components without the need to design and produce jigs and tools in advance. This is the main advantage of additive processes. The costly provision of jigs and tools is not necessary.



**FRAGE 136 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F2/Lektion 06**



**With what series character and with what materials can components be produced in rapid manufacturing?**

Components can be produced in individual and small batch production, not using any tools, directly from the CAD data. A wide range of materials can be processed, particularly plastics, metals, ceramics, etc. Components with sophisticated metallic alloys, e.g., those with base metals of aluminum, titanium, etc., can also be produced.



**FRAGE 133 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F2/Lektion 06**

Specific potentials resulting from the following aspects include: fast production of replacement parts with similar materials (2 pts.), thus shorter delivery times for customer-speciﬁc products (2 pts.); production of components at the place of use (without the need for transport) (2 pts.); simplified way to create integral components (2 pts.); production of components that cannot be manufactured using conventional technology due to their geometry (e.g., medical technology, biotechnology) (2 pts.); new applications in areas such as art, design, and architecture. (2 pts.) – max. 10 pts.



**Explain 5 potentials that arise from rapid manufacturing.**



**FRAGE 134 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F2/Lektion 06**



**What are integral components and why can they be produced well / better using generative rapid manufacturing processes?**

Considerably more complex geometric elements can be realized with generatively manufactured components. This is a trend that enables integral components to be manufactured more economically. As a result, the number of individual components can be drastically reduced. The same reduction also applies to the assembly costs and effort and the associated problems, such as dimensional and positional accuracy. In addition, it is possible to integrate a larger number of functions. This cannot be realized with non-generative processes or can only be realized with much greater costs and effort.



**FRAGE 152 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F2/Lektion 07**



**What functional business processes can be supported with cyber-physical systems?**

Cyber-physical systems are networks of information technology systems (consisting of hardware and software) connected with the mechanical components of a production plant, as well as sensors and actuators that communicate via the Internet. All subsystems within the network operate entirely self-sufficiently.



**FRAGE 151 VON 404**

**DLBINGFVI01\_Offen\_leicht\_F2/Unit 07**



**What is referred to as a cyber-physical system?**

Cyber-physical systems support the complex processes of production planning and manufacturing, from the customer order, through to supplier logistics, to production, and shipping to the customer, as well as the commissioning and training of customer service personnel. The aim is for all the processes run digitally and, despite the individuality of the product, be realized with the least possible effort and resources.

Also correct:

Cyber-physical systems are characterized by a linking of real (physical) objects and processes with information processing (virtual) objects and processes via open, partially global, and information networks that are interconnected at all times.



**FRAGE 149 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F2/Lektion 07**



**What is the essential aspect of the fourth industrial revolution that distinguishes it from the first three industrial revolutions?**

The essential aspect of Industry 4.0 is that state-of-the-art information and communication technology is making its way into production. Following the previous industrial revolutions with the steam engine (1), the assembly line (2) and automation (3), the fourth industrial revolution is currently beginning with smart factories (4).



**FRAGE 150 VON 404**

**DLBINGFVI01\_Offen\_mittel\_F2/Lektion 07**

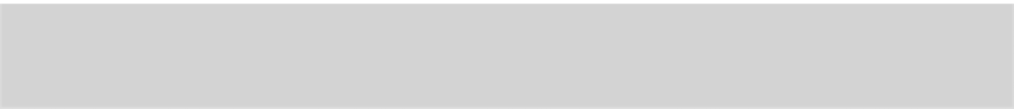
The overall aim of the Industry 4.0 strategy is to improve the productivity and efﬁciency of the manufacturing industry in the future. To execute this strategy, it is necessary to deﬁne the goals of a digital strategy, to create a uniform understanding of the future integration of humans, machines, sensors, actuators, and processes, and to bring about structural change. To this end, a wide variety of recommendations for action, guidelines, and application examples from different industries for the transition from analog to digital processes must be taken into account.



**What is the overall aim of the Industry 4.0 strategy?**



**What fields are to be realized during the introduction of CPS?**



**FRAGE 144 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F2/Lektion 07**

Automation: higher degree of automation in production; digital networks: industrial production is connected to modern information and communication technology (IoT – Internet of Things); cloud computing: storage and calculation of data in clouds; IoT: Internet of Things for networking machines, sensors, processes; communication: intelligent and digital networking of the resources involved (humans, machines, systems, logistics, and products communicate and work together directly); big data: centralized data storage (workpieces, tools, e.g. equipped with RFID chips for data storage); system integration: networked computers with machines, sensors, processes, etc. (2 pts. max. 10 pts.)



**FRAGE 146 VON 404**

**DLBINGFVI01\_Offen\_schwer\_F2/Lektion 07**



**What impact does the transformation to Industry 4.0 have on employees?**

The impact of an Industry 4.0 transformation for employees: in the past, these planning processes were handled by technical staff in the production planning and production control departments. In the future, these planning processes will be handled by IT systems involving all the groups concerned. Alongside this, all data on orders and capacities will be exchanged internally and externally among all participants. All the participating resources will check their capacities and report the planning data for deliveries with detailed quantities and times. A large number of participants are involved in these planning processes.



**FRAGE 154 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 01**



**Which criteria are applied to evaluate the result of a production?**

**Choose an answer:**

**Tool, material, tool machine**

**Material, weight, corrosion resistance**

***Quantity performance, quality, costs***

**Workpiece size, geometry, properties**



**FRAGE 156 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 01**



**Which manufacturing process belongs to the principle of “increase cohesion” according to DIN 8580?**

**Choose an answer:**

**Primary shaping Separation**

**Forming**

***Joining***



**FRAGE 160 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 01**



**Which aspect does manufacturing technology still consider to be essential alongside the technological and physical aspects?**

**Choose an answer:**

**Ecotropholigical aspect**

***Economic aspect***

**Ecological aspect**

**Ecumenical aspect**



**FRAGE 162 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 01**



**According to DIN 8580, to which main group does the**

**“casting” manufacturing process belong?**

**Choose an answer:**

**Changing of material properties**

**Forming**

***Primary shaping* Joining**



**FRAGE 172 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 01**



**Which metal belongs to the ferrous metals?**

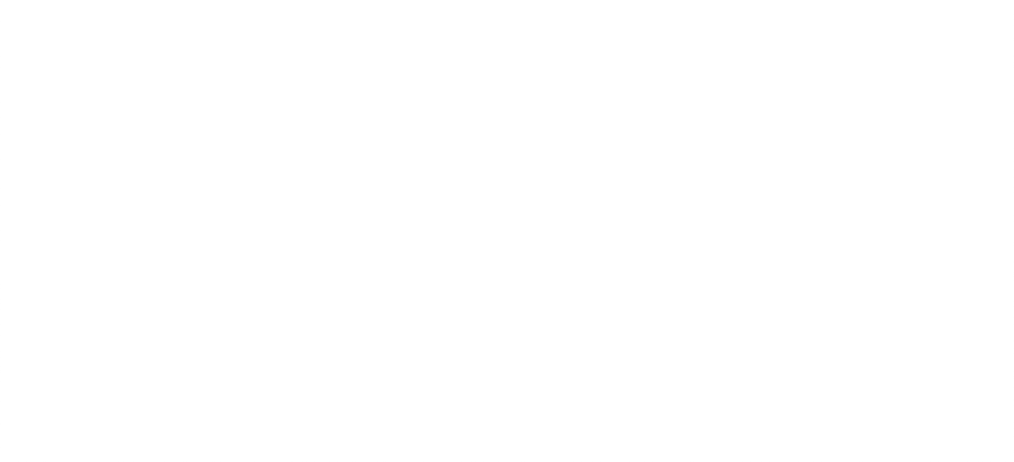
**Choose an answer:**

**Aluminum Copper *Steels* Titanium**



**FRAGE 190 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 01**



**What are laminated composites (GLARE) in aircraft manufacturing made of?**

**Choose an answer:**

***Layers of aluminum and glass fiber-reinforced plastics***

**Layers of magnesium and textile fiber-reinforced plastics**

**Layers of titanium and carbon fiber-reinforced plastics**

**Layers of steel ceramic fiber-reinforced plastics**



**Which central technology is shaping the Industry 4.0 stage?**

**Choose an answer:**

**The robot**

**The computer**

**The transistor**

***The Internet***



**FRAGE 194 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 01**



**FRAGE 240 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 02**



**In recent years, the importance of casting technology has ...**

**Choose an answer:**

**increased.**

**strongly increased.**

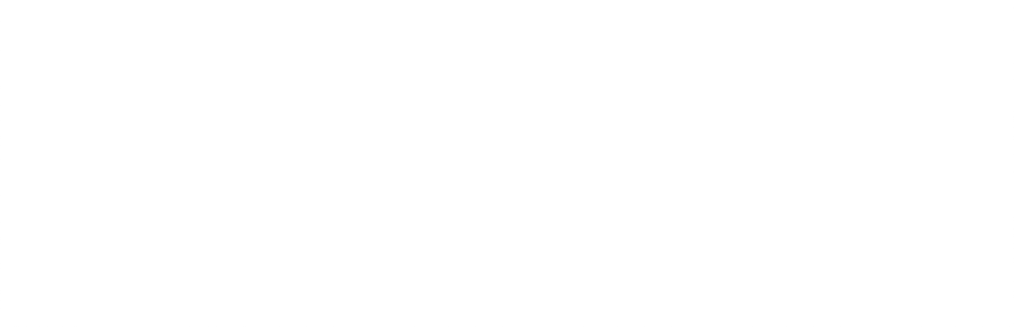
**remained constant.**

***decreased.***



**FRAGE 241 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 02**



**One of the oldest casting processes is the process, ...**

**Choose an answer:**

**investment casting. continuous casting.**

***sand casting.***

**die casting.**



**FRAGE 247 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 02**



**The “pressure forming” process group includes the forming process, ...**

**Choose an answer:**

**stretch forming.**

**rotary bending. *rolling.***

**deep-drawing.**



**FRAGE 245 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 02**



**The “shear spinning” process group includes the forming process, ...**

**Choose an answer:**

***blanking.***

**rolling.**

**widening.**

**roll bending.**



**FRAGE 257 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 02**



**Which share of the world's machining tools are cutting machines?**

**Choose an answer:**

**Approx. 25%**

***Approx. 75%***

**Approx. 50%**

**Approx. 95%**



**FRAGE 255 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 02**



**Which method is now increasingly replacing the “shearing” process?**

**Choose an answer:**

**Pinching**

***Laser* cutting**

**Knife edge cutting Tearing**



**FRAGE 243 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 02**



**According to DIN 8580, “deepening” is a process of the process group, …**

**Choose an answer:**

**bending.**

***tensile forming.***

**pressure forming.**

**tensile-compressive forming.**



**FRAGE 318 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 03**



**When were the additive manufacturing processes developed and**

**patented for the first time in the USA?**

**Choose an answer:**

**1990’s**

**After 2000 1970’s**

***1980’s***



**FRAGE 322 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 03**



**In which subject area have additive manufacturing processes not raised any new legal challenges?**

**Choose an answer:**

**Safety requirements**

**Industrial property rights**

**Producer liability**

***Material property***



**FRAGE 326 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 03**



**In which direction is the laser beam deflected during stereolithography?**

**Choose an answer:**

***X/Y direction***

**Z-direction**

**X-direction**

**X/Z direction**

**FRAGE 314 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 03**



**FRAGE 314 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 03**



**Where do the achievable accuracies of the surfaces lie with the**

**stereolithography process?**

**Choose an answer:**

**Approx. 20 µm**

**Approx. 10 µm**

**Approx. 100 µm**

***Approx. 50 µm***



**FRAGE 325 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 03**



**In selective laser sintering, what is used to apply the powder material?**

**Choose an answer:**

**Screen Mask *Roller* Extruder**



**FRAGE 317 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 03**



**Which process can be used to easily produce architectural models of buildings?**

**Choose an answer:**

**FDM – fused deposition modeling**

**SMS – selective mask sintering**

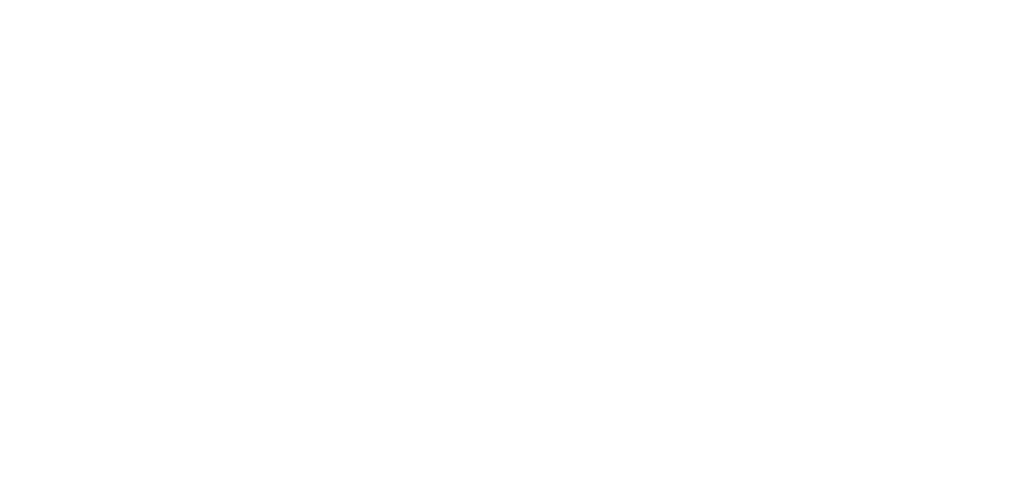
***3D printing***

**STL – stereolithography**



**FRAGE 324 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 03**



**In which increments is the build platform moved during** **stereo lithography process ?**

**Choose an answer:**

**Approx. 0.005 to 0.03 mm**

**Approx. 0,5 to 3.0 mm**

***Approx. 0.05 to 0.3 mm***

**Approx. 5 to 30 mm**



**FRAGE 351 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 04**



**Which is one of the most important advantages of rapid prototyping in automobile manufacturing and aircraft manufacturing?**

**Choose an answer:**

**No surface treatment necessary**

**No machining required**

**No assembly necessary**

***No tools required***



**FRAGE 353 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 04**



**Compared to automobile manufacturing,** **why is aircraft manufacturing a more interesting area for rapid prototyping?**

**Choose an answer:**

**High safety requirements**

***Small batches***

**Large components**

**Low weight**



**FRAGE 352 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 04**



**Which type of model making reduces development times?**

**Choose an answer:**

**Rapid manufacturing**

**Physical mock- up**

**Digital mock- up**

***Rapid prototyping***



**FRAGE 358 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 04**



**Which industries are the focal points of rapid prototyping with additive manufacturing processes?**

**Choose an answer:**

**Household and utility appliances**

**Machinery and plant manufacturing**

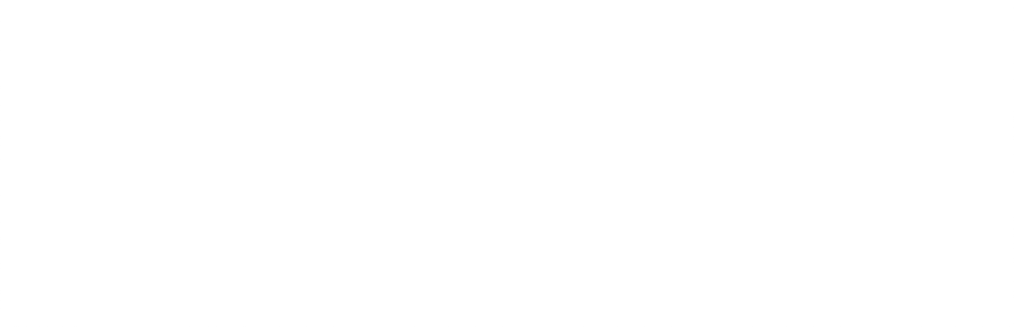
***Automobile and aircraft manufacturing***

**Architecture and design**



**FRAGE 359 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 04**



**Which is not a model type in the context of rapid prototyping?**

**Choose an answer:**

**Design model**

***Partial model* Ergonomic model Functional model**



**FRAGE** **355 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 04**



**Which manufacturing tolerances can be achieved with the additive processes of rapid prototyping?**

**Choose an answer:**

**Approx. 0.002 mm**

**Approx. 2 mm**

**Approx. 0.2 mm**

***Approx. 0.02 mm***



**FRAGE 356 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 04**



**Which minimum surface roughness can be achieved with the additive processes of rapid prototyping?**

**Choose an answer:**

***Min. 20 µm***

**Min. 2 µm**

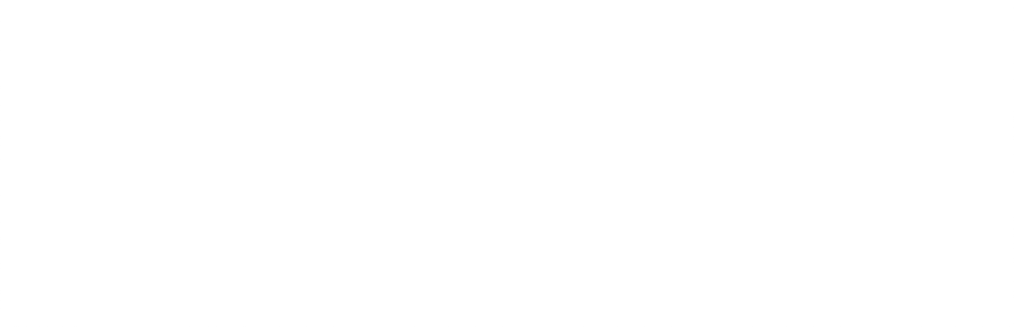
**Min. 100 µm**

**Min. 200 µm**



**FRAGE 369 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 05**



**Which is reduced by rapid tooling?**

**Choose an answer:**

**Material *Time* Weight Personnel**



**FRAGE 370 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 05**



**Which is needed at an early phase of development?**

**Choose an answer:**

**Aircraft models**

**Cutting models *Functional models***

**Architectural models**



**FRAGE 372 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 05**



**Which is produced in rapid tooling for casting technology?**

**Choose an answer:**

**Casting box Cores**

***Core cavity***

**Molds**



**FRAGE 361 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 05**



**With rapid tooling, which materials are used for molds and cores to later cast components made of metals e.g., aluminum?**

**Choose an answer:**

**Crosslinked plastics**

**Wood**

***Sand with bonding agent***

**Steel molds**



**FRAGE 363 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 05**



**Which generative manufacturing process is the most important for the production of metallic tools in mold making, particularly for the production of plastic injection molds?**

**Choose an answer:**

***SLM process* SLK process SLS process**

**3D printing process**



**FRAGE 365 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 05**



**Which process approach can be used in the early development phase**

**to create sand molds and sand cores to produce initial casts and, in turn, real cast parts?**

**Choose an answer:**

**Indirect production**

***Direct production***

**Inverse production**

**Collective production**



**FRAGE 366 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 05**



**Aluminum injection molds produced with rapid tooling**

**also allow the use of ...**

**Choose an answer:**

**aluminum fiber-reinforced plastics.**

**aramid fiber-reinforced plastics.**

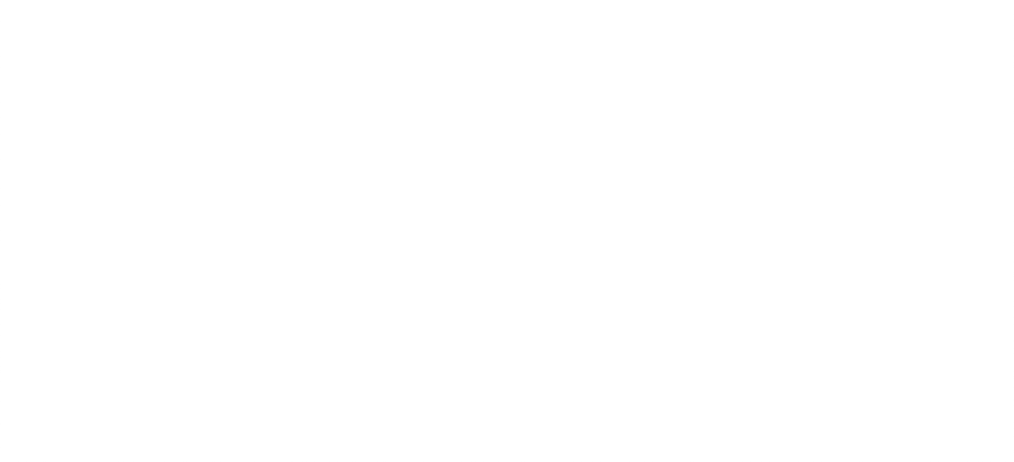
***glass fiber-reinforced plastics.***

**carbon fiber-reinforced plastics.**



**FRAGE 373 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 06**



**Which is the main advantage of rapid manufacturing?**

**Choose an answer:**

***Initial components can be produced from the series material even before series production.***

**The tools achieve high quality compared to series production.**

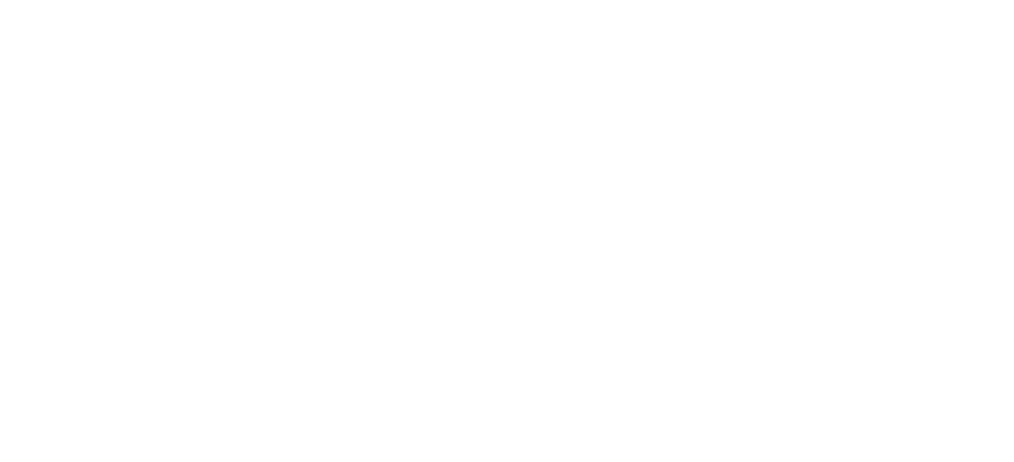
**A particularly high quantity performance can be achieved, even before series production.**

**A wide range of different materials can be processed.**



**FRAGE 375 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 06**



**Which marketing argument for the use of rapid manufacturing is significant?**

**Choose an answer:**

***Reduction in the “time-to-market” time***

**Low cost**

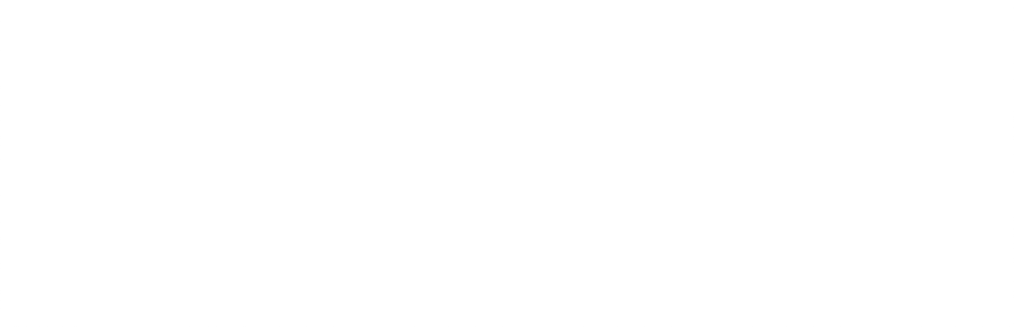
**High quality**

**High customer acceptance**



**FRAGE 385 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 06**



**Which is not a new application area for rapid manufacturing?**

**Choose an answer:**

**Architecture Art**

**Design *Painting***



**FRAGE 378 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 06**



**Which is not an advantage of rapid manufacturing compared to conventional manufacturing?**

**Choose an answer:**

**Tool-free**

**Location-independent**

***Established***

**Flexible**



**FRAGE 381 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 06**



**Which components can be produced more easily with rapid manufacturing?**

**Choose an answer:**

**Substrate components Differential components *Integral components* Sentimental components**



**FRAGE 379 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 06**



**Which products are not suitable for rapid manufacturing?**

**Choose an answer:**

**Toys**

**Replacement Parts**

***Tires***

**Implants**



**FRAGE 383 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 06**



**Which is not a component of an alloy material of rapid**

**manufacturing?**

**Choose an answer:**

***Ar* V**

**Mg**

**Ti**



**FRAGE 395 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 07**



**Which industrial revolution is characterized by the**

**“steam engine”** **innovation?**

**Choose an answer:**

***First industrial revolution***

**Fourth industrial revolution**

**Third industrial revolution**

**Second industrial revolution**



**FRAGE 401 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 07**



**What does the CPS abbreviation stand for?**

**Choose an answer:**

**Computer-physical systems**

**Computer-process systems**

**Corporate program strategy**

***Cyber-physical systems***



**FRAGE 403 VON 404**

**DLBINGFVI01\_MC\_leicht/Lektion 07**



**Which does the Industry 4.0 strategy include?**

**Choose an answer:**

**Internationalization of production**

**Liberalization of production**

***Digitalization of production***

**Modularization of production**



**FRAGE 387 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 07**



**Which are the most important aspects of cyber-physical systems**

**Choose an answer:**

**Computer software and hardware**

***Networking of systems and the Internet of Things***

**System analysis and programming**

**Purchasing and distribution network**



**FRAGE 389 VON 404**

**DLBINGFVI01\_MC\_mittel/Lektion 07**



**In which industry is CPS applied?**

**Choose an answer:**

**Trades and crafts**

**Tourism**

***Industrial production***

**Agriculture**



**FRAGE 391 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 07**



**Which are the essential goals of the 4th industrial revolution?**

**Choose an answer:**

**Reduction of energy consumption, green production, Sustainability**

***Intelligent and digital networking of involved resources***

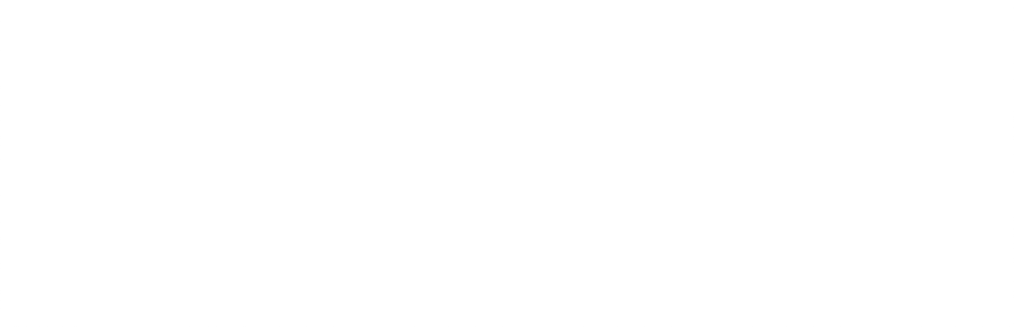
**Reduction of manual activity, release of workers, structural change**

**Resource conservation, sustainability, and data protection**



**FRAGE 399 VON 404**

**DLBINGFVI01\_MC\_schwer/Lektion 07**



**Which system component transmits the ACTUAL data of processes?**

**Choose an answer:**

**Actuator Multiplier *Sensor* Processor**