

Document:

Output 2 - Common Learning Outcomes for the blacksmith profession

Introduction

This document describes blacksmith qualifications for the EIA project. The qualifications are based on learning outcomes.

In the project, all partners assembled information about the blacksmith qualifications in their country. The information contained a brief or more detailed description of key activities, competences, skills and associated knowledge. Out of this huge amount of information, we identified which key activities were common in the qualifications in the partner countries. These were described in competence units. The competence units are closely linked to professional activities. The competence units are defined in terms of learning outcomes. Each learning outcome is expressed and can be assessed as a whole; including personal and social competences. Knowledge, skills and attitudes (competences) are not described separately nor the procedures and criteria for assessment.

In the project, the EQF level is identified for all qualifications. Note that there is no qualification at level 1. This level is too basic. None of the project partners has a blacksmith qualification on this level. There are qualifications at level 2, 3, 4 and 5.

Note: in this document the blacksmith and student are referred to as male, however where 'he' is written, you can also read 'she'.

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EQF Level 2 Blacksmith trainee

Working context

The qualification on level 2 prepares the student for working as a blacksmith trainee in a workshop, smithy or construction company together with one or more colleagues and/or a supervisor. His or her work consists of applying basic techniques of metalwork and forging to manufacture forging work or constructions for various industries, building and the private market.

Role, responsibility and autonomy

The student manufactures forging work and constructions based on working drawings, working assignments and instructions. He or she masters basic forging techniques and is able to solve routine problems using simple rules and tools. The student is responsible for his or her own work. He or she works under supervision with some autonomy.

Complexity

The complexity of the student's work is determined by the following factors:

- work that concerns both singular forging work and assembled forging work/constructions
- certain deformation techniques such as bending and deformation during forging
- manufacturing several identical workpieces of constructions
- the risk factor with regard to dimensioning and quality
- faults that arise from deformation during forging
- basic factual knowledge in the field of forging is needed

Competence units

The qualification is described in competence units, which are closely linked to professional activities of a blacksmith. The competence units are defined in terms of learning outcomes:

1. Preparing forging work
2. Manufacturing forging work
3. Assembling forging work/constructions
4. Measuring and checking the manufactured ironwork
5. Finishing the executed forging work

Unit 1. (Level 2) Preparing forging work

The aim of this unit is to provide the student with the knowledge, understanding and skills required to prepare the manufacturing of forging work.

Learning outcomes

The student will be able to:

- read and interpret assignments, drawings and sketches for the execution of construction work and simple forging work
- use his or her analytical capacity and form an image of the kind of work he or she has to execute
- make simple design sketches, taking into account the style of the product based on examples or pictures
- gather the equipment to be used, and set and adjust machines and manual equipment
- gather the materials to be used, and draw and place marks on the material
- prepare the forge fire
- consult colleagues, supervisors in case of problems
- use his or her social and communicative skills during teamwork so that internal and external work can progress without disturbance

Unit 2. (Level 2) Manufacturing forging work

The aim of this unit is to provide the student with the knowledge, understanding and skills required to manufacture forging work, which may or may not become part of a construction. Forging work is manufactured from ferrous bar, profile, plate- and pipe material.

Learning outcomes

The student will be able to:

- work safely with forge/forge furnace, tools and materials for forging
- understand and speak the technical language of forging
- convert (simple) technical drawings into forging work
- work with lifting and transportation means and with the most common machines and manual tools
- apply widely used basic forging techniques (including forging of wedges, hot bending, twisting, swaging, pins, cutting holes, riveting, ball forging, and preservation)
- use separating operations, deformation techniques, common joining techniques, relevant welding techniques
- apply safety-, environmental- and health requirements during the work activities, signal deviating situations regarding health and safety requirements and report them
- solve routine problems using simple rules and tools
- manage the forge fire
- use his or her social and communicative skills during teamwork so that internal and external work can progress without disturbance

Unit 3. (Level 2) Assembling forging work/constructions

The aim of this unit is to provide the student with the knowledge, understanding and skills required to build up the forging work to an assembled construction.

Learning outcomes

The student will be able to:

- connect the singular forging work
- apply different detachable joining techniques in the assemblage of the detachable construction parts
- apply different common welding techniques in the assemblage of the non-detachable construction parts
- manufacture flange and clamp joints
- compile workpieces using rivets and arc welders
- work with lifting and transportation means to move the forging work
- apply safety-, environmental- and health requirements during the work activities
- use his social and communicative skills during teamwork so that internal and external work can progress without disturbance

Unit 4. (Level 2) Measuring and checking the manufactured ironwork

The aim of this unit is to provide the student with the knowledge, understanding and skills required to detect mistakes, faults and deviations in his or her forging work.

Learning outcomes

The student will be able to:

- intermittently perform visual inspections on his or her own work whether it does meet the set requirements, especially the dimensioning of his work
- use common measurement tools
- detect mistakes, faults and deviations in an early stage of the process and report them
- inspects on the exterior and the safe functioning of the assembled forging work
- recognise work defects and take measures to prevent them such as appearance of doublings by inclusions, overheating of the material
- perform possible corrections with regard to the dimensioning and (form and location) tolerances
- solve mistakes and deviations immediately and/or report them to the supervisor
- take the initiative to consult colleagues and supervisor(s)
- external work can progress without disturbance

Unit 5. (Level 2) Finishing the executed forging work

The aim of this unit is to provide the student with the knowledge, understanding and skills required to finish the forged product and to finish the forging process.

Learning outcomes

The student will be able to:

- preserve workpieces by cleaning, painting, varnishing, blackening, patinating and/or browning
- apply finishing techniques for the ironwork (including deburring, removing sharp edges, brushing)
- use his social and communicative skills during teamwork so that internal and external work can progress without disturbance
- clean his or her workplace

EQF Level 3 Blacksmith

Working context

The qualification on level 3 prepares the student for working as a blacksmith in a workshop, smithy or construction company together with one or more colleagues and/or a supervisor. His or her work consists of applying basic techniques of metalwork and forging to manufacture forging work or constructions for various industries, building and the private market.

Role, responsibility and autonomy

The student manufactures forging work and constructions based on working drawings and working assignments. He or she selects and applies basic methods, tools, materials and information to accomplish tasks and solve problems. The student is responsible for the completion of assigned tasks. He or she adapts his or her own behaviour to circumstances in solving problems.

Complexity

The complexity of the students work is determined by the following factors:

- work that concerns both singular forging work and assembled forging work/constructions
- certain deformation techniques such as bending and deformation during forging
- manufacturing several identical workpieces of constructions
- the risk factor with regard to dimensioning and quality
- faults that arise from deformation during forging
- knowledge of facts, principles, processes and general concepts in the field of forging is needed

Competence units

The qualification is described in competence units, which are closely linked to professional activities of a blacksmith. The competence units are defined in terms of learning outcomes:

1. Preparing forging work
2. Manufacturing forging work
3. Assembling forging work/constructions
4. Measuring and checking the manufactured ironwork
5. Finishing the executed forging work

Unit 1. (Level 3) Preparing forging work

The aim of this unit is to provide the student with the knowledge, understanding and skills required to prepare the manufacturing of forging work.

Learning outcomes

The student will be able to:

- read and interpret assignments, drawings and sketches for the execution of construction work and simple forging work
- use his analytical capacity and form an image of the kind of work he has to execute
- make a work plan based on the set quality requirements and determine the necessary order of operations for his work
- make simple design sketches taking into account the style of the product based on examples or pictures
- gather the equipment to be used and set and adjust machines and manual equipment
- gather the materials to be used, inspect the materials and assess whether identified deviations fall within specifications
- draw and place marks on the material
- perform preventive maintenance on machines, manual and measurement equipment (cleaning and anointing)
- prepare the forge fire
- consult colleagues, supervisors in case of problems
- use his social and communicative skills during teamwork so that internal and external work can progress without disturbance

Unit 2. (Level 3) Manufacturing forging work

The aim of this unit is to provide the student with the knowledge, understanding and skills required to manufacture forging work, which may or may not become part of a construction. Forging work is manufactured from ferrous bar, profile, plate- and pipe material.

Learning outcomes

The student will be able to:

- work safely with forge/forge furnace, tools, machines and materials for forging
- convert technical drawings into forging work by hand and CAD
- apply widely used forging techniques
- use separating operations, deformation techniques, common joining techniques, relevant welding techniques
- record the number of worked hours per completed construction part and record material use of his work
- apply emergency assistance in case of accidents
- detect situations timely that hinder the optimal execution of the work and report them to his supervisor
- solve routine problems using rules and tools
- manage the workplace and forge fire
- adequately execute qualitatively good work, also under time pressure

Unit 3. (Level 3) Assembling forging work/constructions

The aim of this unit is to provide the student with the knowledge, understanding and skills required to build up the forging work to an assembled construction.

Learning outcomes

The student will be able to:

- assemble forging work/constructions from start to finish
- connect the singular forging work
- apply different detachable joining techniques in the assemblage of the detachable construction parts
- apply different common welding techniques in the assemblage of the non-detachable construction parts
- manufacture flange and clamp joints
- compile workpieces using rivets and arc welders
- work with lifting and transportation means to move the forging work
- meet the requirements that are set for some products in terms of laws and regulation and the required inspection marks
- register the hours and material use of his work
- apply safety-, environmental- and health requirements during the work activities
- signal deviating situations regarding health and safety requirements and report them
- detect situations timely that hinder the optimal execution of the work and report it
- use his social and communicative skills during teamwork so that internal and external work can progress without disturbance

Unit 4. (Level 3) Measuring and checking the manufactured ironwork

The aim of this unit is to provide the student with the knowledge, understanding and skills required to detect mistakes, faults and deviations in an early stage of the process to guarantee the quality and prevent delays in the manufacture of forging work.

Learning outcomes

The student will be able to:

- intermittently perform visual inspections on his own work whether it does meet the set requirements, especially the dimensioning his work
- guard the process
- choose and employ the inspection tools common to his profession
- use common measurement tools and calibrate them if necessary
- detect mistakes, faults and deviations in an early stage of the process to guarantee the quality and prevent delays in the manufacture of forging work
- inspects on the exterior and the safe functioning of the assembled forging work
- recognise work defects and take measures to prevent them such as appearance of doublings by inclusions, overheating of the material
- check if the forging work/construction is possible to assemble on location
- determine whether identified deviations fall within specifications
- perform possible corrections with regard to the dimensioning and (form and location) tolerances
- solve mistakes and deviations immediately
- take the initiative to consult colleagues and supervisor(s)
- give his opinion regarding possible solutions in deviating solutions and listens to the opinion of others
- use his social and communicative skills during teamwork so that internal and external work can progress without disturbance

Unit 5. (Level 3) Finishing the executed forging work

The aim of this unit is to provide the student with the knowledge, understanding and skills required to finish the forged product and to finish the forging process.

Learning outcomes

The student will be able to:

- preserve workpieces by cleaning, painting, varnishing, blackening, patinating and/or browning
- apply finishing techniques for the ironwork (including deburring, removing sharp edges, brushing)
- archive relevant information such as records of the number of worked hours and used materials to provide a process and/or product administration
- record auxiliary tools, working drawings, work plan and order of operations to provide a process and/or product administration
- Use his social and communicative skills during teamwork so that internal and external work can progress without disturbance

EQF Level 4. Blacksmith team leader

Working context

The qualification on level 4 prepares the student for working as a blacksmith team leader in a workshop, smithy or construction company. The blacksmith team leader works in a team with one or more colleagues, gives instructions to them and supervisors their routine work. The work consists of applying both basic and more advanced techniques of metalwork and forging to manufacture forging work or constructions for various industries, building and the private market. The work is merely predictable and routine work.

Role, responsibility and autonomy

The student manufactures forging work and constructions based on working drawings and working assignments. He masters both basic and more advanced forging techniques as well as problem solving skills. The student gives training and guidance to his team and/or trainees. He supervises their routine work. The student is responsible for his own work and that of his team. He takes some responsibility for the evaluation and improvement of work. The student is able to design and carry out orders independently. The student has contact with customers and suppliers.

Complexity

The complexity of the students work is determined by the following factors:

- mastering different more complex forging techniques
- delivering high quality products as a team
- working under time pressure
- work planning
- solving practical and communication problems which may arise with colleagues, customers and suppliers
- creating a good learning climate for working with and guiding team members, smiths in training
- broader factual and theoretical knowledge within the field of forging is needed

Competence units

The qualification is described in competence units, which are closely linked to professional activities of a blacksmith. The competence units are defined in terms of learning outcomes:

1. Preparing forging work
2. Manufacturing forging work and assembling constructions
3. Measuring and checking the manufactured ironwork
4. Managing the work
5. Guiding team members
6. Advising customers

Unit 1. (Level 4) Preparing forging work

The aim of this unit is to provide the student with the knowledge, understanding and skills required to prepare the manufacturing of forging work for his team.

Learning outcomes

The student will be able to:

- collect and process design data
- make drawings
- assess the productibility/feasibility of a drawing or sketch
- decide which forging techniques, materials and machines have to be used
- develops designs, also for customers
- make time- and cost calculations
- organise people and resources

Unit 2. (Level 4) Manufacturing forging work and assembling constructions

The aim of this unit is to provide the student with the knowledge, understanding and skills required to manufacture forging work and assembling constructions. Forging work is manufactured merely from ferrous bar, profile, plate- and pipe material.

Learning outcomes

The student will be able to:

- convert technical drawings of more complex forging work and deviating shapes of the forging work to high quality forging work
- apply widely used basic forging techniques, separating operations, deformation techniques, common joining techniques and relevant welding techniques
- forge using mechanically driven forging hammers (air or spring hammer with auxiliary tools)
- execute more complex forging operations such as stretching, fullering, drawing, forging of bends and square bends, cleaving/splitting, deforming, plattening, deviding and applying ornaments
- integrate modern techniques with the smith craft like cutting, machining techniques, roll bending and angle bending and welding
- assemble more complex forging work/constructions form start to finish using different techniques
- detect situations timely that hinder the optimal execution of the work and take adequate measures to solve the situation
- employ his signalling and solving power to prevent deviating situations including health and safety requirements
- deliver the work

Unit 3. (Level 4) Measuring and checking the manufactured ironwork

The aim of this unit is to provide the student with the knowledge, understanding and skills required to detect mistakes, faults and deviations in an early stage of the process to guarantee the quality and prevent delays in the manufacture of forging work.

Learning outcomes

The student will be able to:

- intermittently perform visual inspections on his own work and that of his team members whether it does meet the set requirements
- continuously guard the process
- detect mistakes, faults and deviations in an early stage of the process and solve mistakes and deviations immediately
- take the initiative to consult the customer in deviating situations
- use his communicative and social skills, technical understanding and quality awareness to introduce solutions to all people involved

Unit 4. (Level 4) Managing the work

The aim of this unit is to provide the student with the knowledge, understanding and skills required to organise and manage the routine work of his team.

Learning outcomes

The student will be able to:

- organise and arrange the work of his team members from the early preparations till the forging, assembling, finishing and preservation
- compile a work plan depending on the complexity of the forging work / constructions and time pressure
- incorporate moments of inspection and measurement in the work plan to guard the progress and incorporate feedback moments in the work plan for team members, supervisors and customers
- supervise tests of products and systems
- supervise execution of maintenance tasks
- provide a process and product administration
- collect and process production data
- communicate with suppliers and customers about organising and delivering work
- monitor normal processes in the workshop
- monitor the budget

Unit 5. (Level 4) Guiding team members

The aim of this unit is to provide the student with the knowledge, understanding and skills required to guide and support team members.

Learning outcomes

The student will be able to:

- instruct colleagues with regard to quality requirements, health and safety requirements, order of operations
- communicate the tasks and expectations to his team members
- give 1-to-1 or group training regarding practical skills, working techniques and problem solving skills
- supervise the work of his team
- create a good working and learning climate

Unit 6. (Level 4) Advising customers

The aim of this unit is to provide the student with the knowledge, understanding and skills required to advise customers.

Learning outcomes

The student will be able to:

- take the initiative to consult customers
- independently advice customers
- raise issues briefly and clearly
- give his opinion
- listen to others
- use his communicative skills both verbal as in writing
- act in a client-oriented manner

EQF Level 5. Blacksmith specialist/ Blacksmith owner

Working context

The qualification on level 5 prepares the student for working as a blacksmith specialist in a workshop, smithy or construction company or as a blacksmith owner. The blacksmith specialist/owner works in a team with one or more colleagues, gives instructions and guidance to them or manages the department in a middle and larger company. His work consists of applying advanced techniques of metalwork and forging to manufacture forging work and constructions for various industries, building and the private market. Creative thinking and problem solving is part of his work. The blacksmith specialist has specialised himself in certain forging techniques or forging works such as restoration forging, art forging, The blacksmith owner has besides forging skills also project management, budget management, quality control and HRM skills as well as an entrepreneurial mind-set.

Role, responsibility and autonomy

The student manufactures forging work and constructions based on working drawings and working assignments. He masters advanced forging techniques. The student gives training and guidance to his team, supervises, reviews and develops performance of them. He becomes an expert in certain forging techniques or forging works or develops his entrepreneurship and learns to run a small company.

Complexity

The complexity of the students work is determined by the following factors:

- mastering complex forging techniques
- develop creative design
- develop creative solutions to abstract problems
- exercise management and supervision in contexts of work where there is unpredictable change
- review and develop performance of self and others
- specialised knowledge within the field of forging is needed and an awareness of the boundaries of that knowledge
- laws, restrictions and possibilities for starting a business

Competence units

The qualification is described in competence units, which are closely linked to professional activities of a blacksmith. The competence units are defined in terms of learning outcomes:

1. Product design and manufacturing
2. Entrepreneurship
3. Restauration forging
4. Art forging
5. Forging ship fittings
6. Manufacturing specific tools
7. Damascus forging
8. Forging with different materials
9. Forging locksmith work

Unit 1. (Level 5) Product design and manufacturing

The aim of this unit is to provide the student with the knowledge, understanding and skills required to design and manufacture specialised products.

Learning outcomes

The student will be able to:

- have a command of the process of product design and development, collaborating with designers and manufacturers as needed
- design products and know the significance of design for the final result
- know design rights and copyrights and comply with them
- use aesthetic principles and visual information
- use calculation programs and construction programs on the computer
- plan work processes, coordinate schedules and work on the construction site
- use the most commonly used materials and supplies and know their properties and how they are procured
- use the tools and machines and know how to operate and maintain them safely
- make products in a skilled and customer-oriented manner
- understand the significance of sustainability and take ecological aspects into account
- take into account the consumer rights in the field concerned, as well as a business operator's main obligations and responsibilities in manufacturing and marketing products
- be aware of the significance of ergonomics, occupational safety and well-being at work
- act as welding coordinator, acquire the necessary certificates and monitor the welding work to be carried out
- interact with customers, other trades and architects

Unit 2. (Level 5) Entrepreneurship

The aim of this unit is to provide the student with the knowledge, understanding and skills required to start up a forging business and/or act as entrepreneur.

Learning outcomes

The student will be able to:

- use his potentials and competencies for acting as entrepreneur
- develop an entrepreneurial mindset
- investigate the risks and potentials of the forging sector
- act according to the quality systems and perform quality control
- apply the obligations of product safety and product liability associated with forging
- consider the options for starting a business and forms of businesses
- develop financially profitable business activities on the basis of a business idea
- use his knowledge of the operational and financial requirements and effects of production to price products and services profitably
- sell and market his products and/or market his company
- use networks in business activities
- manage projects and budget
- perform employee management and use HRM skills
- exercise the management in his own workshop or carry responsibility in medium and large enterprises
- apply rules and regulations in operational workshop management
- decide on new machines, tools and procedures in the workshop/company

Unit 3. (Level 5) Restauration forging

The aim of this unit is to provide the student with the knowledge, understanding and skills required to manufacture and repair ancient (ornamental) forging work.

Learning outcomes

The student will be able to:

- use old drawings, photographs, models and obtained information to make design sketches and working drawings (scale 1:1)
- know, recognize and distinguish styles of buildings and forging throughout the centuries
- distinguish (art and work) styles in ornamental forging work based on external characteristics
- execute the main features of the forging styles
- produce a dismantling plan
- dismantle work of forging and casting work, taking into account the environment
- mark pieces in the right way
- performing color research
- capture data through photos, movies, drawings, marks and markings and design a plan
- manufacture and repair forged nails, nails, staples, hooks, thumbs, lashes, spikes complete with spikes and rings, strips complete with plates, spikes and rings, thumb hung with matching thumbs (apple and pear shaped) complete with fasteners, skinny hung, complete with fasteners, rivets complete with fasteners, locks complete with keys and fasteners
- repair and manufacture pieces such as church cruises, church cranes, fence works, molding, cast iron stairs with wrought iron handrails, sidewalk and armrests, balusters
- perform repairing and restoring activities in various materials
- determine the moment of replacement or repair, this in consultation with the supervisor
- calculate the required material and estimate the time needed
- assemble workpieces by means of warm or cold sounding, straps, straps, wells and where necessary using modern connectivity techniques
- calculate the lengths of rivets, straps, straps
- clean the workpieces with a suitable technique to preserve damage and the original structure
- choose the right surface treatment and apply the preservative layer for the protection against external influences

Unit 4. (Level 5) Art forging

The aim of this unit is to provide the student with the knowledge, understanding and skills required to create ideas and translate them to forging sculptures, artwork or decorative elements.

Learning outcomes

The student will be able to:

- use ideas, comments, photographs and conversations with clients, architects or users to make drawings
- discuss drawings with users and clients
- create a final result in collaboration with users and clients
- get agreement about the result to be delivered and aspects as price, time and materials
- perform all the techniques available for the manufacturing of sculptures to produce the sculpture
- compose a sculpture by means of warm or cold sounding, straps, straps, wells and where necessary using modern connectivity techniques
- clean the sculpture with a suitable technique to preserve damage
- choose the right surface treatment and apply the preservative layer for the protection against external influences
- hand over the final result to the user or client
- organise the financial issues

Unit 5. (Level 5) Forging ship fittings

The aim of this unit is to provide the student with the knowledge, understanding and skills required to dismantle existing forged work and repair it or manufacture new parts.

Learning outcomes

The student will be able to:

- use old drawings, photographs, models and obtained information to make design sketches and working drawings
- perform drawing work with various techniques
- produce a dismantling plan
- dismantle work of forging and casting work, taking into account the environment
- capture data through photos, movies, drawings, marks and markings and design a plan
- manufacture and repair forged nails, nails, staples, hooks, thumbs, lashes, spikes complete with spikes and rings, complete strips with plates, spikes and rings, fasteners, locks complete with keys and fasteners
- repair and manufacture winches
- repairing fence works consisting of fences, columns, sockets and fences
- restore stairs with wrought iron
- perform repairing and restoring activities in various materials
- determine the moment of replacement or repair, this in consultation with the supervisor
- calculate the required material and estimate the time needed
- assemble workpieces by means of warm or cold sounding, straps, straps, wells and where necessary using modern connectivity techniques
- calculate the lengths of rivets, straps, straps
- clean the workpieces with a suitable technique to preserve damage
- choose the right surface treatment and apply the preservative layer for the protection against external influences

Unit 6. (Level 5) Manufacturing specific tools

The aim of this unit is to provide the student with the knowledge, understanding and skills required to manufacture specific tools for example for artistic blacksmithing or for other handcrafts.

Learning outcomes

The student will be able to:

- use examples, drawings, comments, photos and conversations with clients or user drawings
- reach a final result in collaboration with users and clients
- perform drawing work with various techniques
- detect material types that are necessary to make a particular tool, repair tools or manufacture missing parts
- manufacture molds and tools to perform the work
- soften the forged tools, cure the forged tools and let it out so that the tool is ready for use
- decide which coolant medium to use
- work with mechanically driven hammers and presses
- work with lathe, milling machine, drill and other machines needed to manufacture the required workpieces

Unit 7. (Level 5) Damascus forging

The aim of this unit is to provide the student with the knowledge, understanding and skills required to weld iron into patterns.

Learning outcomes

The student will be able to:

- prepare a package composed of alternating layers of different metal sheets
- adapt the forge and weld the stratified package
- apply decorative techniques
- model the package in Damask steel for welding processes or for exportation
- cleaning and polish the workpiece
- use chemical detection of etching
- welding iron into patterns
- manufacture finishing work on knife blades

Unit 8. (Level 5) Forging with different materials

The aim of this unit is to provide the student with the knowledge, understanding and skills required to forge with different materials like copper or brass.

Learning outcomes

The student will be able to:

- use decorative techniques
- draw designs and copy them onto the surface of the material
- shape the material and finishing its exterior
- manufacture artifacts wrought of copper or brass or forged from steel
- treat the surface of artistic forging products by tin using chemical dyeing or paints
- work with different (new) materials

Unit 9. (Level 5) Forging locksmith work

The aim of this unit is to provide the student with the knowledge, understanding and skills required to forge locksmith work.

Learning outcomes

The student will be able to:

- realise an orthogonal projection of a lock that needs to be built
- realise an exploded-view drawing of the assembling components of the keyhole
- cut the basic supporting pillar on the copy of the drawing
- forge the components
- finish touches to the forged components with trial tests
- develop the keyhole
- construct the springs
- perform temporary assembling with screws for the trial test of each different element
- perform definitive assembling with rivets
- take care for treatment and preservation
- construct the guiding jumpers that will make the bolts slide (the elements are forged and refined by filing)
- describe the construction and the force load of the springs
- plan a keyhole having circular crossing plates on holders
- decorate its constructional components
- describe the movement of the crossing bolts and the striking mechanism