Learning/Training Documents

SIEMENS AUTOMATION COOPERATES WITH EDUCATION (SCE) | 07/2024

TIA Portal Module 000-000
Module and Concept Description

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We would like to thank Michael Dziallas Engineering and all those involved for their support in creating this SCE learning/training document.

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Module and Concept Description

1 General overview of the modules

This module description is intended to help you select the contents that are relevant, interesting and technical interest to you.

The chapter numbers comprise 6 digits, e.g. 000-000 for the module description. The first two digits refer to the topic area. The third digit signifies the highest structure level of the topic. Most of the time, "1" stands for the S7-1200 controller and "2" for the S7-1500. Where present, "3" stands for the S7-300 controller and "4" for IOT2000EDU. The digits after the dash refer to a particular chapter. If this chapter is available for different controllers, there is only a difference in the third digit of the first three digits and not in the last three digits after the dash.

1.1 Topic planning

The following figure presents an overview of the topics already available in SCE and those envisaged for the future.

Basic modules contain SCE learning/training documents for first-time users, but are also suitable for advanced users.

Advanced modules are recommended particularly for advanced users or individuals who have completed the basic modules. New modules are always being added at the website siemens.com/sce.

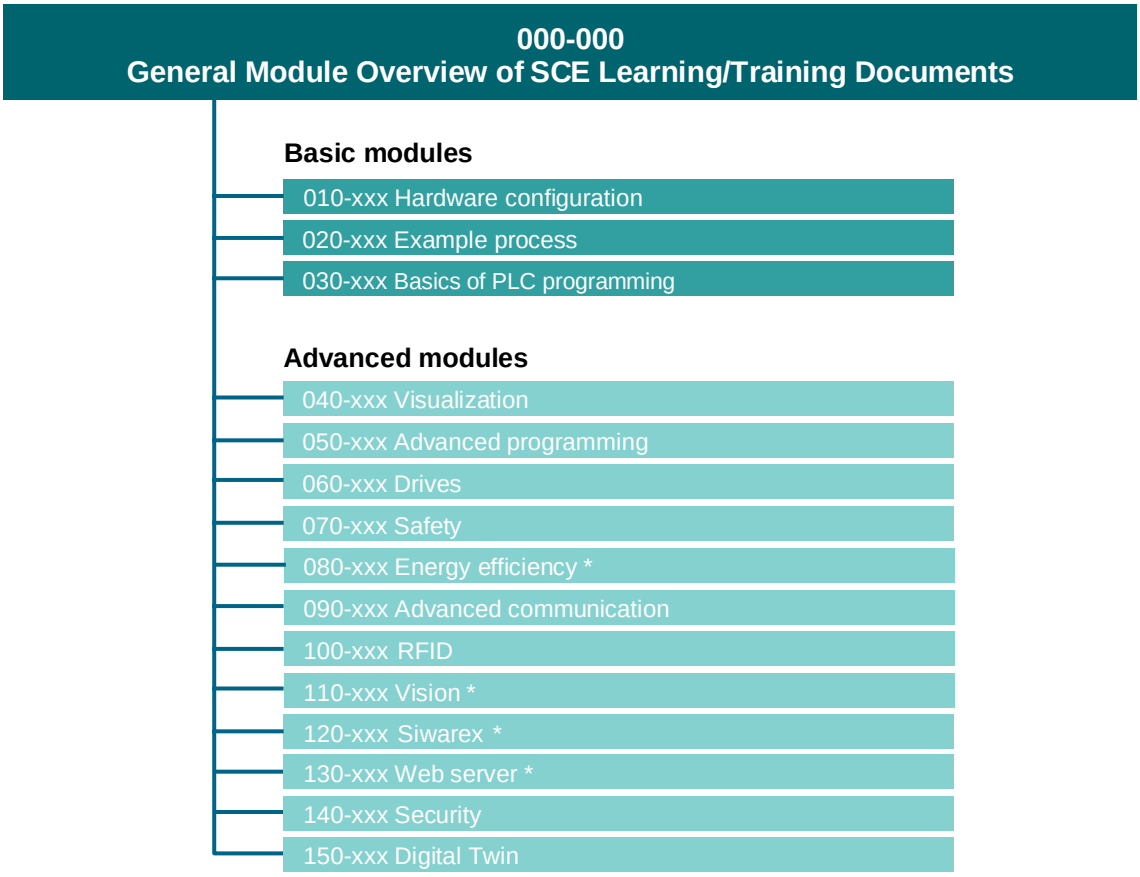
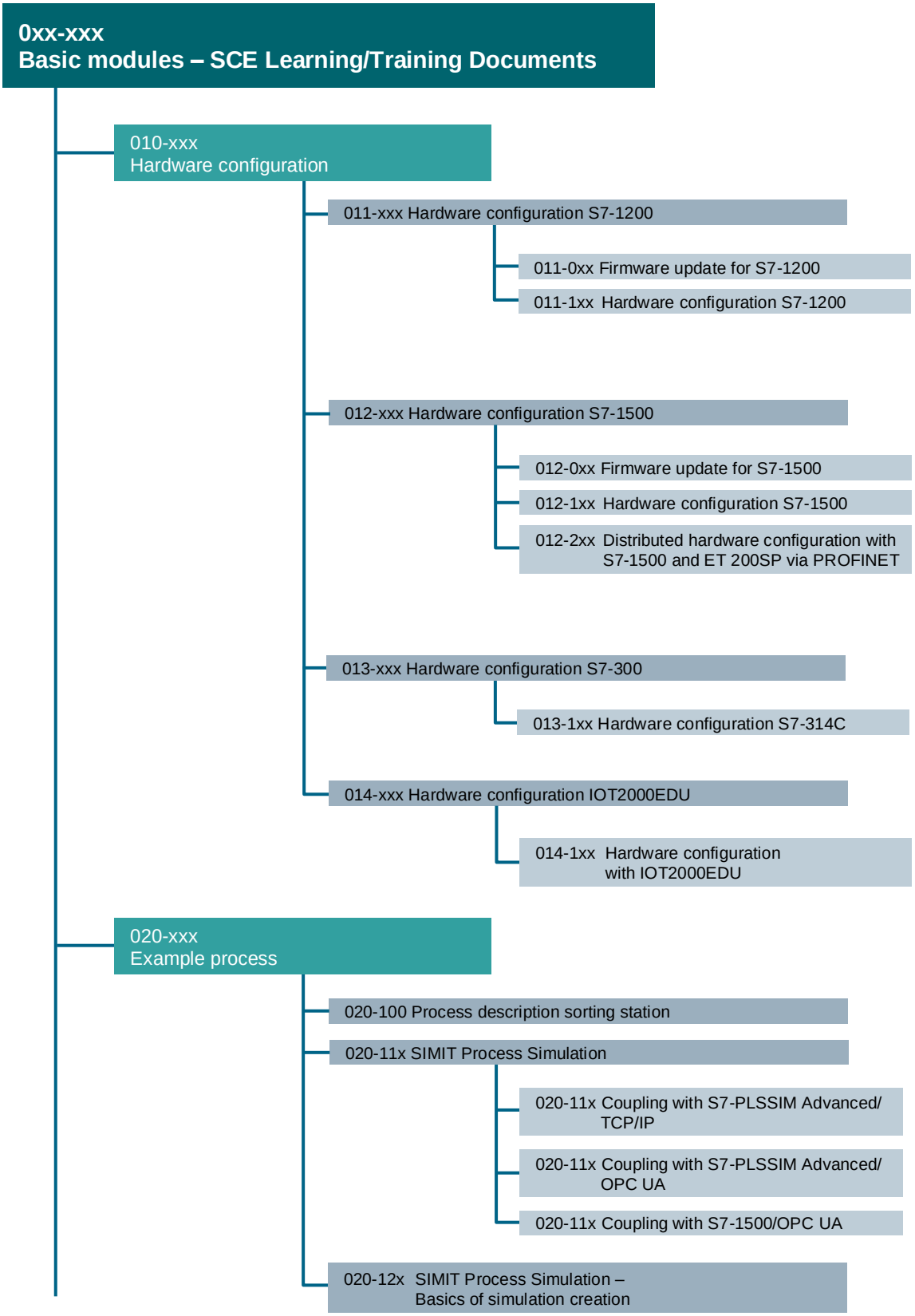


Figure 1: Topic overview * Upcoming

1.2 Basic modules

The basic modules include the following topics: "Hardware Configuration", "Example Processes" and "Basics of PLC Programming", see Figure 2. The structure of these modules is explained in the following.



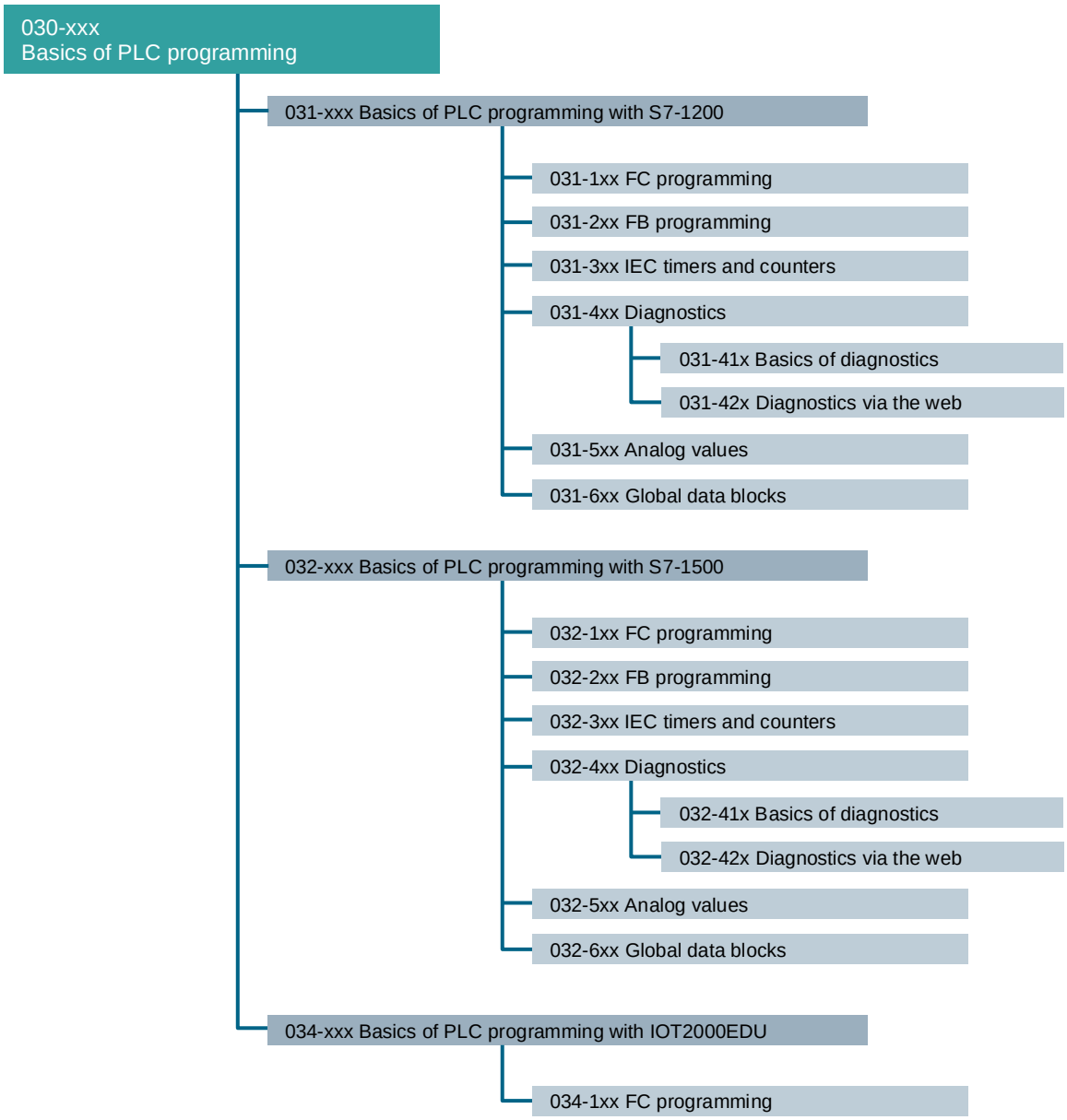


Figure 2: Overview of basic modules

Structure of the basic modules

010-xxx Hardware configuration

Since the hardware configuration can be performed and learned independently of a specific task, this topic has been positioned first.

It is divided into the hardware configuration of the various controllers: S7-1200, S7-1500, S7-300 and IOT2000EDU. These controllers are available as SCE Trainer Packages. There is a further subdivision into different architectures or types of configuration for each of the different controllers. Specifically, these currently consist of the unspecified/centralized configuration, distributed configuration with PROFIBUS and distributed configuration with PROFINET.

020-xxx Example processes

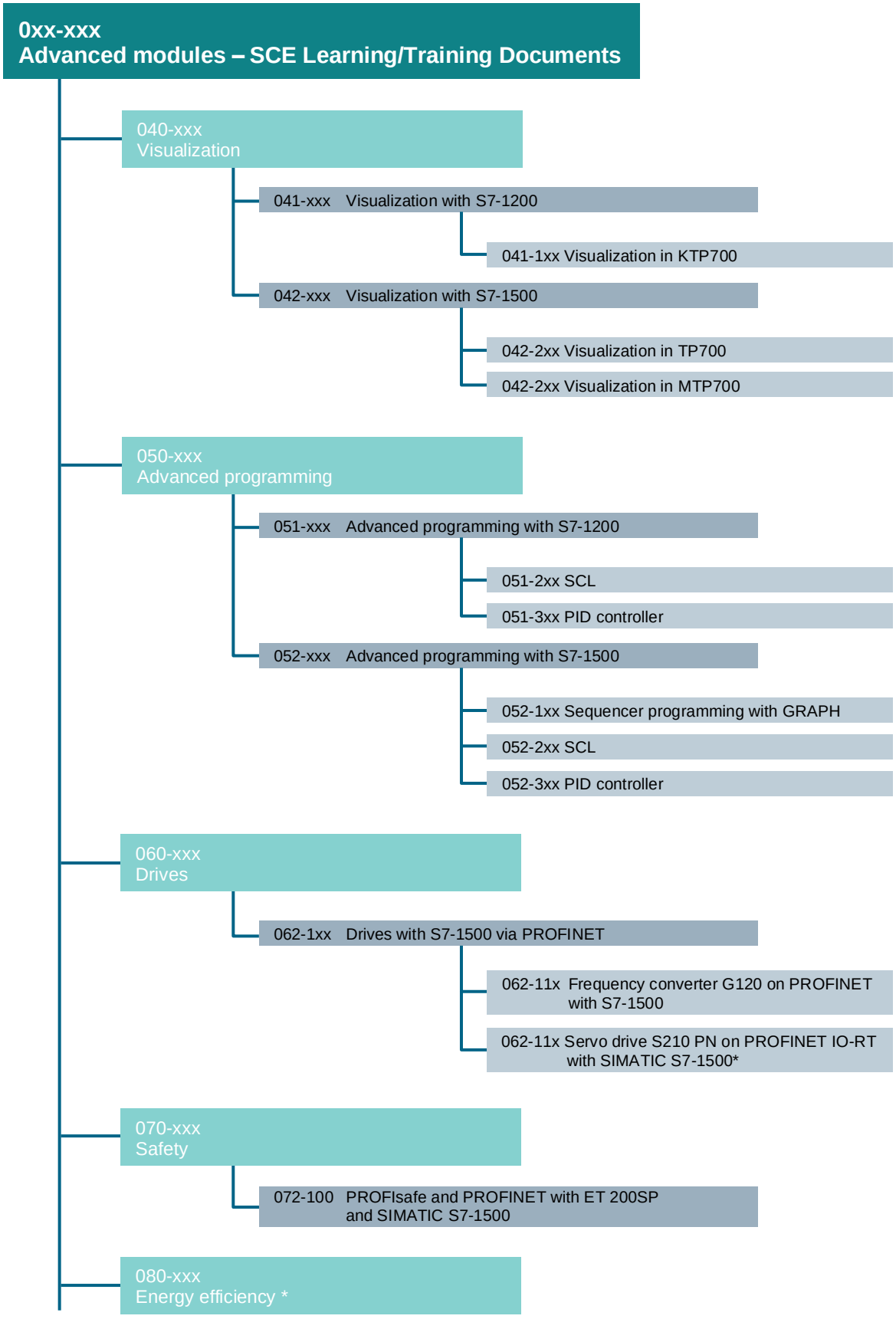
This topic is not a training unit. Instead, it describes example processes that are to be used in the subsequent chapters for specific tasks. To date, only the sorting station example process is used for programming in the example process modules. The objective of SCE is to implement this example process with a SIMIT model so that learners can test their implementation in a simulated process.

030-xxx Basics of PLC programming

The "Basics of PLC Programming" topic is also divided into the S7-1200 and S7-1500 controllers and IOT2000EDU. Its purpose is to make getting started easier. The S7-300 controller is not explicitly mentioned here since its programming is, apart from a few small differences, basically the same as that of S7-1500. The subdivision below the controllers is identical in both cases. It starts with FC and FB programming. Simple tasks are provided here in each case to make it easy to get started. "Counters and timers", "Diagnostics", "Analog values" and "Global data blocks" round out this topic area.

1.3 Advanced modules

The advanced modules cover overarching or in-depth topics such as Visualization, Advanced Programming, Drives, Safety, Advanced Communication, RFID, Security and Digital Twin. The following explains how these modules are structured.



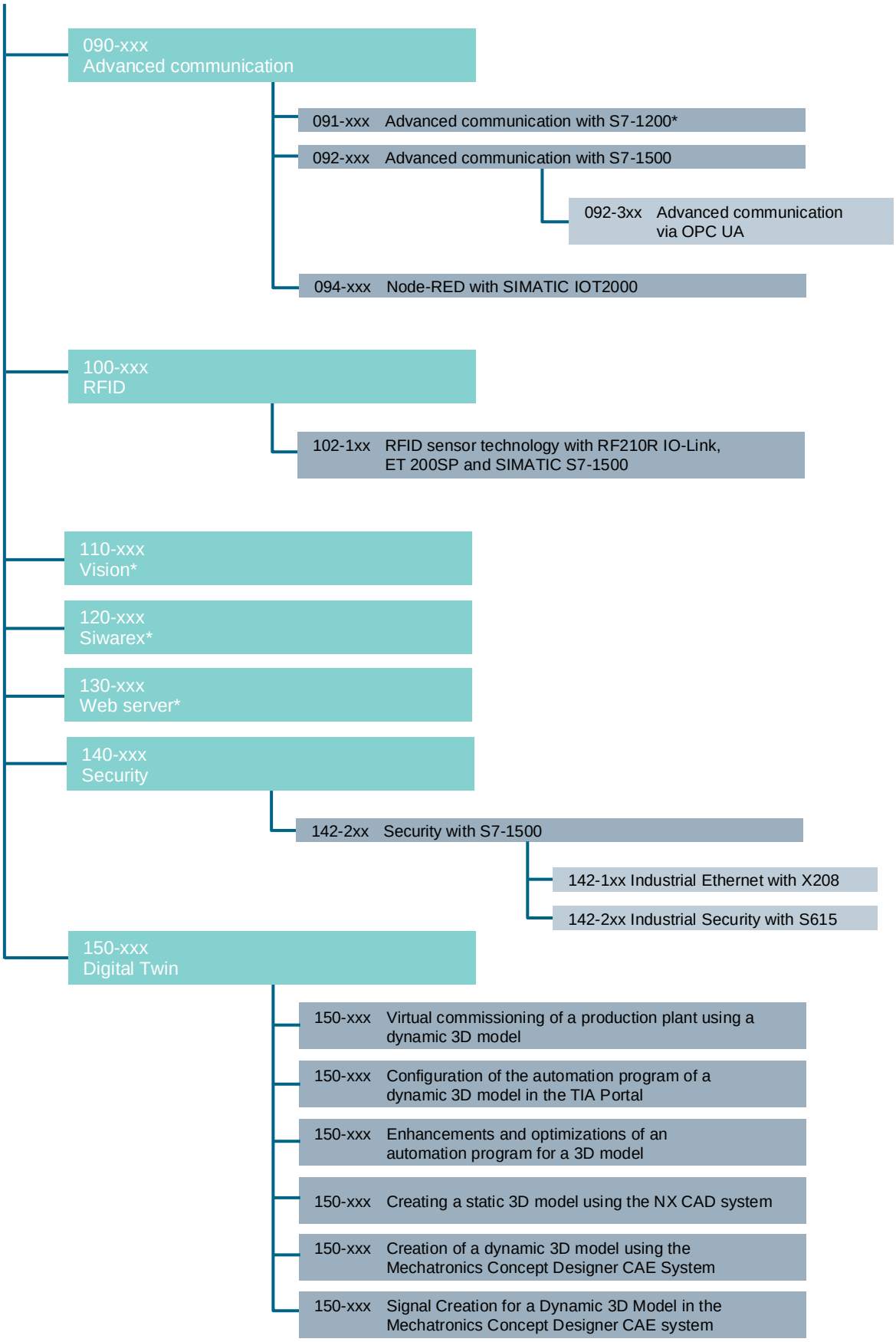


Figure 3: Overview of advanced modules * Upcoming

Structure of the advanced modules

Advanced modules are also divided into the S7-1200 and S7-1500, S7-300 and IOT2000EDU controllers, whereby the focus is on S7-1500. Contents for S7-1200 are only shown when they differ significantly from those of S7-1500.

040-xxx Visualization

The "Visualization" topic is only indirectly dependent on the controller. The utilized panel or PC is the deciding factor here. Within the visualization hardware segments, different chapters are offered, for example adding a panel and its configuration, simple visualizations, and animations.

050-xxx Advanced programming

The "Advanced programming" topic includes programming topics for advanced users and are taught using S7-1500. Learners should be able to transfer the contents to other controllers on their own at this stage.

060-xxx Drives

The "Drives" topic follows the same structure. Frequency converters of the SINAMICS G and SINAMICS S series are used here. The Startdrive software is used for parameter assignment. Control is performed via PROFIBUS and PROFINET as well alternative bus systems.

070-xxx Safety

Safety-related applications on PROFINET (PROFIsafe) are commissioned in the “Safety” modules topic. Here, the protective door of a sorting station is to be monitored via PROFINET using a CPU 1516F-3 PN/DP as the IO controller and an ET 200SP as the IO device. An EMERGENCY STOP is also implemented here using the ET 200S.

080-xxx Advanced communication

"Advanced communication" includes, in particular, communication topics such as communication between controllers, and between controllers and other systems via OPC UA and alternative bus systems. Of course, topics related to plant-wide communication and wireless communication can also be found here.

100-xxx RFID

"RFID" includes sensor technology topics for RFID systems. Here, data is read from and written to RFID transponders. The RFID sensor systems can be connected to an S7-1500 controller via PROFIBUS, PROFINET and IO-Link as well as alternative bus systems.

140-xxx Security

The “Security” modules present the configuration and secure connection of the S7-1500 controller to other networks for Industrial Ethernet Switch SCALANCE XC208 and Industrial Ethernet Security SCALANCE S615.

150-xxx Digital twin

Similar to all SCE learning/training documents, the "Digital twin" modules have a modular structure and can be easily completed by following step-by-step instructions. They are designed for use with SIMATIC STEP 7 Professional V15 or higher, SIMATIC WinCC Advanced V15 or higher, PLCSIM Advanced V2.0 or higher and NX MCD V12.0 or higher.

2 Concept description

2.1 Material at a glance

The modules described above are available as SCE learning/training documents.

Additional SCE learning and training material is available to assist in planning lessons or for self-study. This includes the SIMIT model, which implements the example process as a simulation. The simulation can be started with just a demo version of SIMIT and used to check your own programming. A real plant is therefore not needed. If you would rather work with real systems, you can build one yourself based on the description of the example process. SCE currently does not offer a real model of the example process.

Furthermore, presentations are offered that contain a brief introduction to the contents of each chapter and are thus ideally suited for inclusion in the lesson. Of course, these presentations can also be used for self-study.

Model solutions/projects are another important component of the SCE learning and training material. They allow you to compare your own solution but are also suited to working on just a few topics and building on a model solution.

Advanced materials, such as videos and animations, are integrated as links within the SCE learning/training document. They are also available on the SCE website or on YouTube.

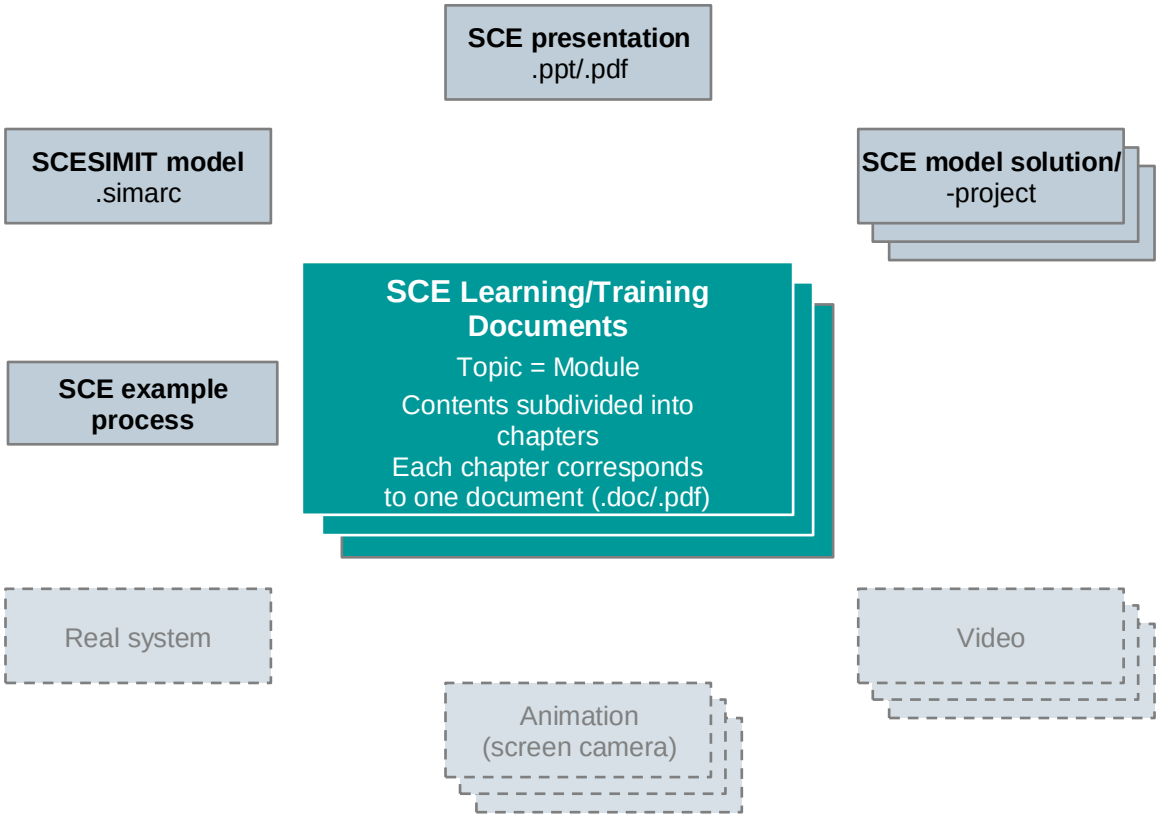


Figure 4: Overview of SCE learning and training material

2.2 Structure of the individual chapters based on the teaching methodology

At the core of the learning and training materials are the SCE learning/training documents in which each chapter forms a self-contained training unit.

As shown in Figure 5 below, the chapters always start with a goal. The theory considered relevant is presented in the following section. A specific task is formulated, which is then planned and implemented using an example. The task is then processed following structured, step-by-step instructions and verified using a checklist. A practical section follows, beginning with a new task that is now to be planned and implemented independently. A checklist at the end enables learners to verify their solution.

The purpose of the exercise is to allow independent execution of a specified task. No help is given in planning and implementation (= execution). This can also be used as a supplemental task for adept learners who are faster than the rest of the class, or for self-study.

The individual chapters can be worked on as modular units. Specific preceding chapters form a basis on which to build and are listed at the start of every module under "Prerequisites".

The chapters are structured according to the concept described above.

The example process is designed to continuously accompany learners so that understanding the actual process does not command too much attention, and the focus can instead be on the actual training contents. At the same time, the newly added "Planning" section acts as a helpful intermediary between the task and solution and as a guide for planning the implementation.

The step-by-step instructions have also been newly structured for the current concept. This helps first-time users to obtain an overview of what they are doing and enables advanced users to skip certain individual steps which they are already familiar with.

A final checklist at the end of the exercise again enables learners to verify their own solution. In this way, the instructions can be worked through on a highly individual basis depending on the level of knowledge. The checklist also contains information about what should be able to be tested and what should work with the implemented solution. Ideally, if an item on the checklist is not completed, information on the section from which this error might have originated can also be provided. The checklist enables students/trainees to independently check whether all of the step-by-step instructions have been carefully worked through and allows them to successfully complete the module on their own.

The model project can also be used for comparison of the solution. A model solution (= model project) is provided for each module and contains the result of the structured step-by-step instructions and the exercise. Depending on the module basis, other solutions may of course also be possible.

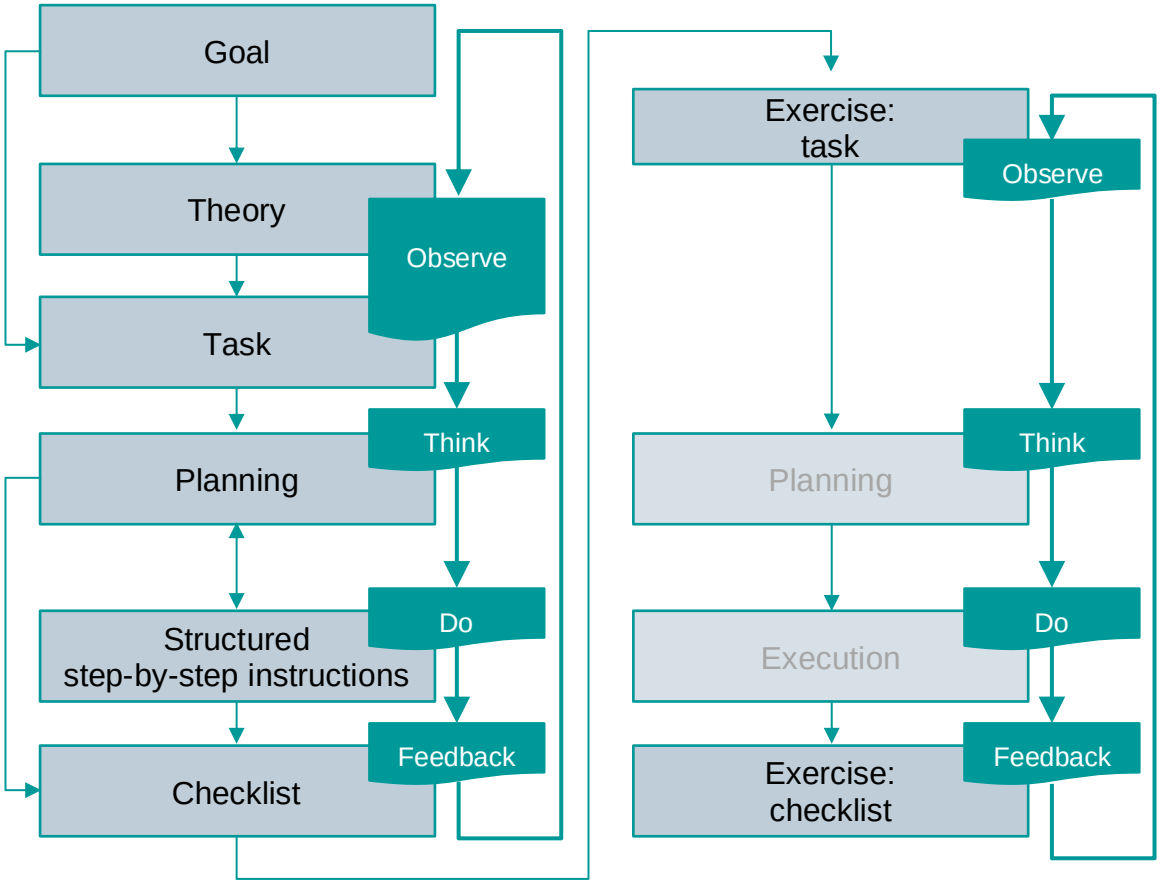


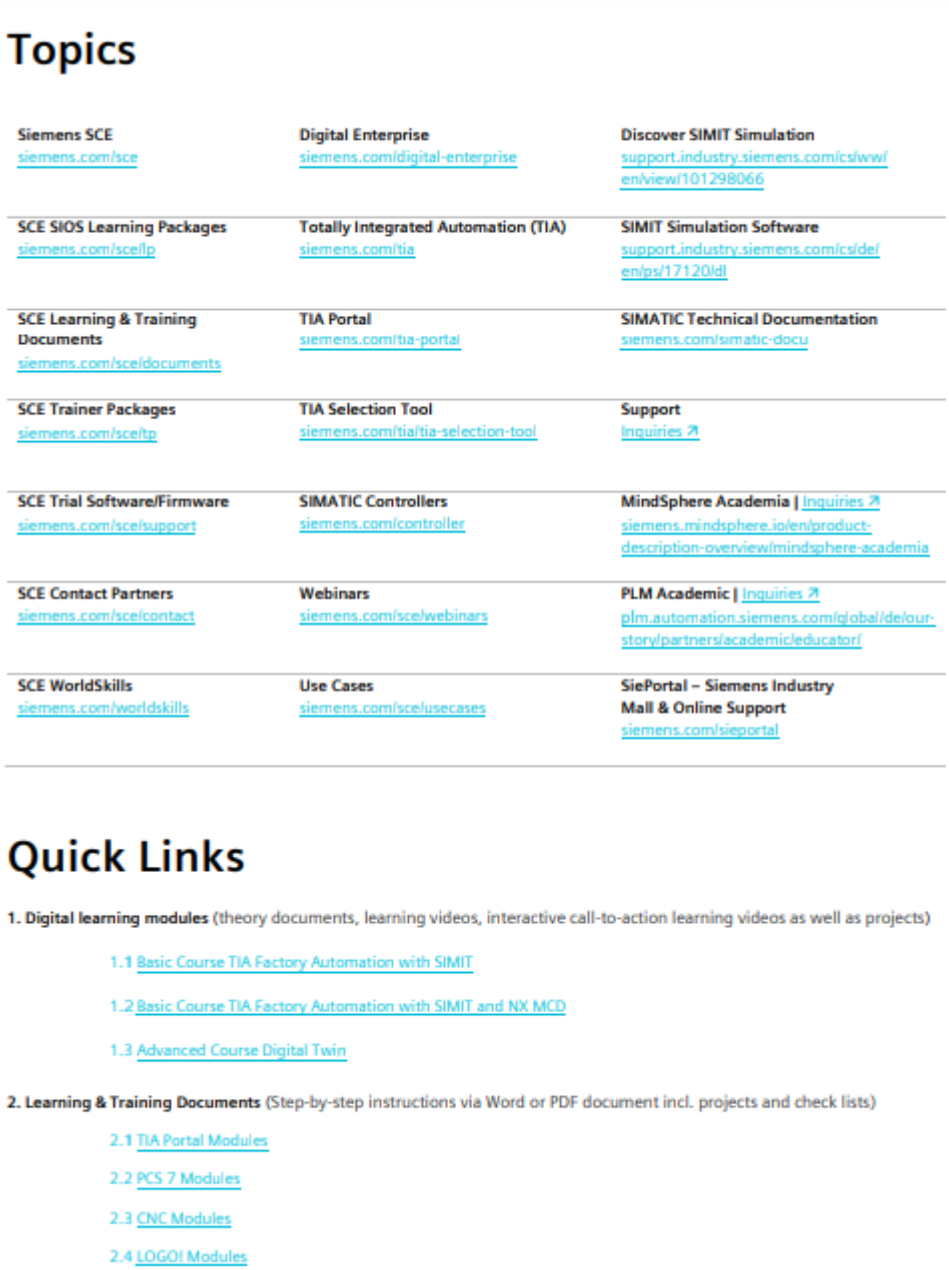
Figure 5: Structure of teaching methodology of the SCE learning/training documents

3 Additional information

You can find additional information as an orientation aid for initial and advanced training, for example: Getting Started, videos, tutorials, apps, manuals, programming guidelines and trial software/firmware, at the following link:

siemens.com/sce/quicklinks

Preview "SCE Quick Links"



Topics

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Quick Links

1. Digital learning modules (theory documents, learning videos, interactive call-to-action learning videos as well as projects)

1.1 Basic Course TIA Factory Automation with SIMIT

1.2 Basic Course TIA Factory Automation with SIMIT and NX MCD

1.3 Advanced Course Digital Twin

2. Learning & Training Documents (Step-by-step instructions via Word or PDF document incl. projects and check lists)

2.1 TIA Portal Modules

2.2 PCS 7 Modules

2.3 CNC Modules

2.4 LOGO! Modules

More information

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SCE Learning/Training Documents
siemens.com/sce/module

SCE Trainer Packages
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Siemens
Digital Industries, FA
P.O. Box 4848
90026 Nuremberg, Germany
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