

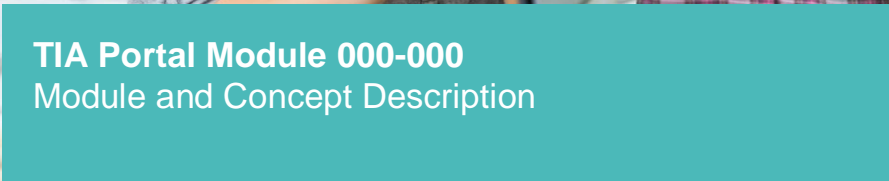


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Learn-/Training Document

Siemens Automation Cooperates with Education
(SCE) | 01/2020



TIA Portal Module 000-000
Module and Concept Description



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Table of contents

1	General overview of the modules	4
1.1	Topic planning	4
1.2	Basic modules	5
1.3	Advanced modules	8
2	Concept description.....	11
2.1	Material at a glance	11
2.2	Structure of the individual chapters based on the teaching methodology	12

Module and Concept Description

1 General overview of the modules

The module description is intended to help you select the contents that are relevant, interesting and technically suited to you.

The numbers of the chapters contain 6 digits, e.g. 000-000 for the module description chapter. The first two digits refer to the topic area. The third digit is also the highest outline level of the topic. Most of the time, "1" stands for the S7-1200 controller and "2" for S7-1500. Where present, "3" stands for the S7-300 controller and "4" stands 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 digits.

1.1 Topic planning

The following figure presents an overview of the topics already available in SCE and those still being contemplated.

Basic modules contain SCE training curriculums for first-time users but can also be used for advanced users.

Advanced modules are recommended in particular for advanced users or individuals who have completed the basic modules. New modules are always being added at the website [siemens.com/sce](https://www.siemens.com/sce).

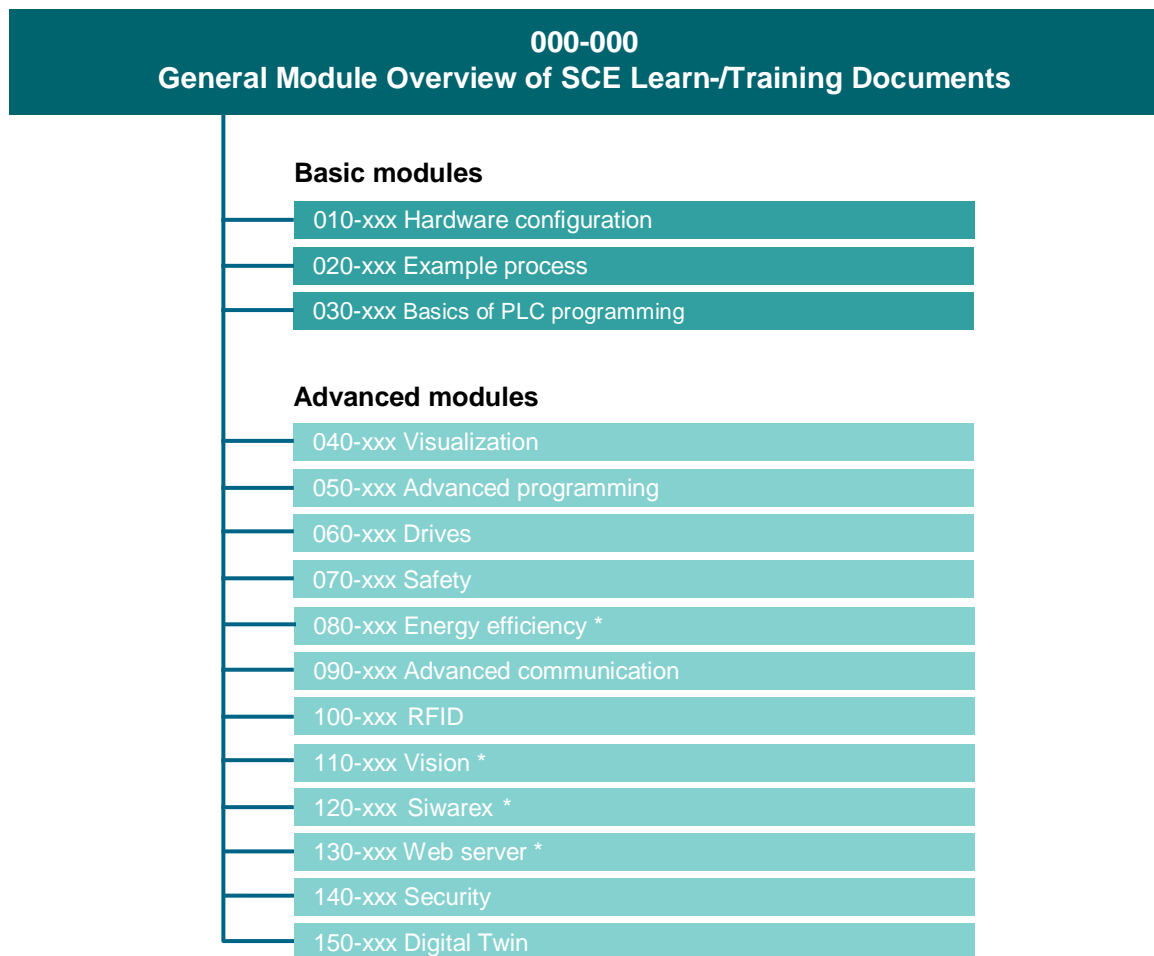
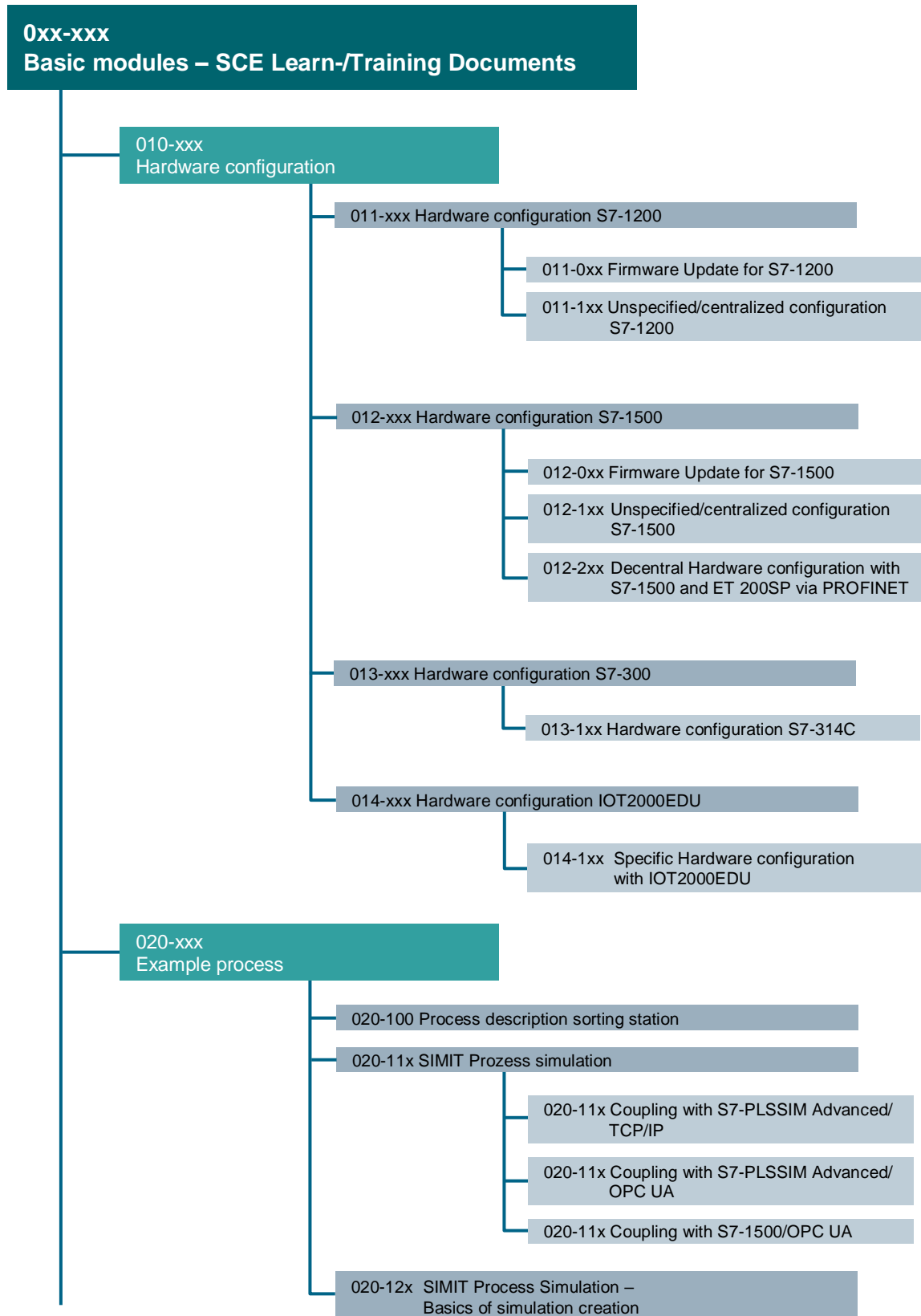


Figure 1: Overview of the available topics

* 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.



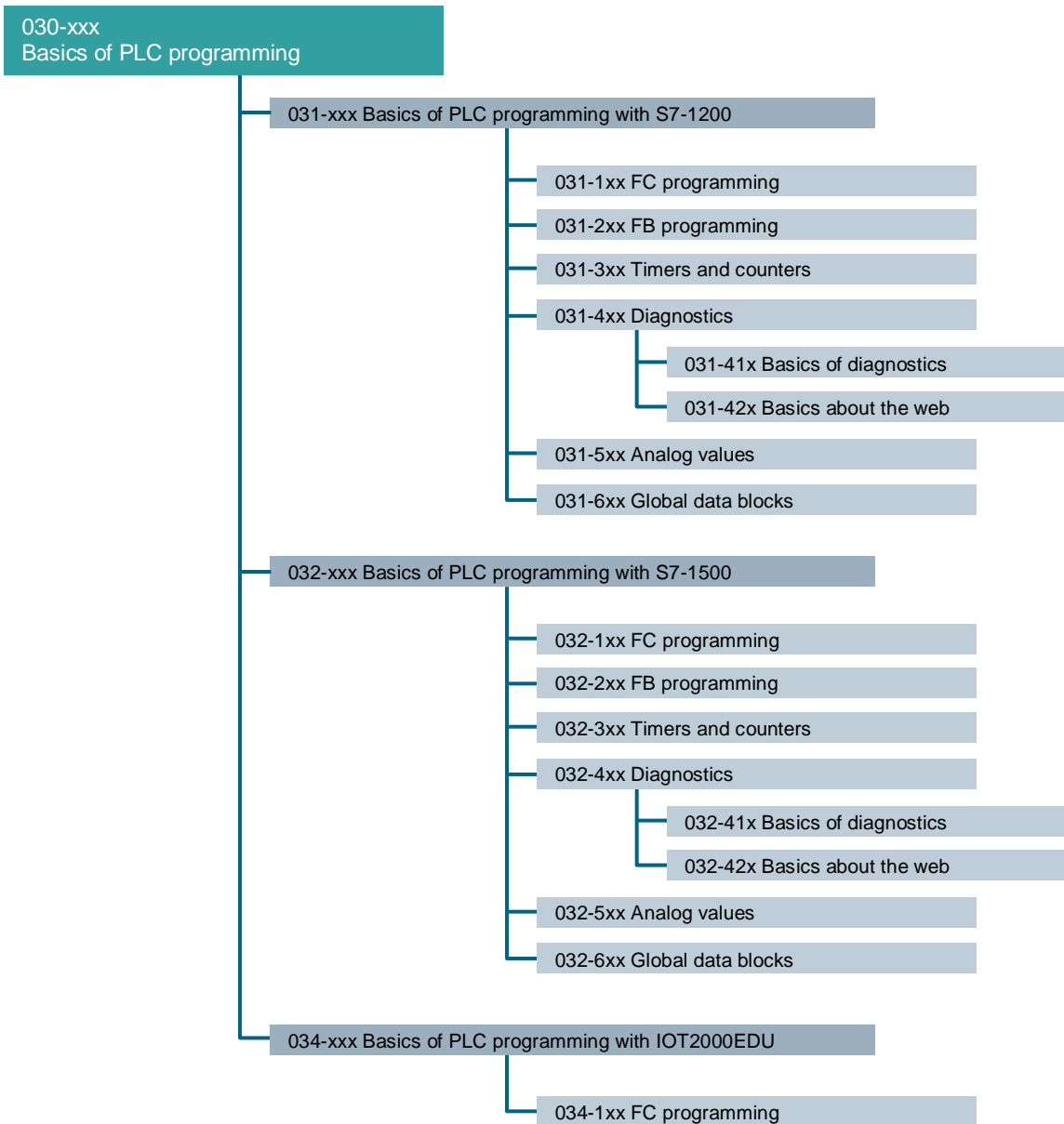


Figure 2: Overview of basic modules

Structure of the basic modules

010-xxx Hardware Configuration

Because the hardware configuration can be performed and learned independent of a specific task, this topic has been placed first.

The topic of hardware configuration is subdivided 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 below 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

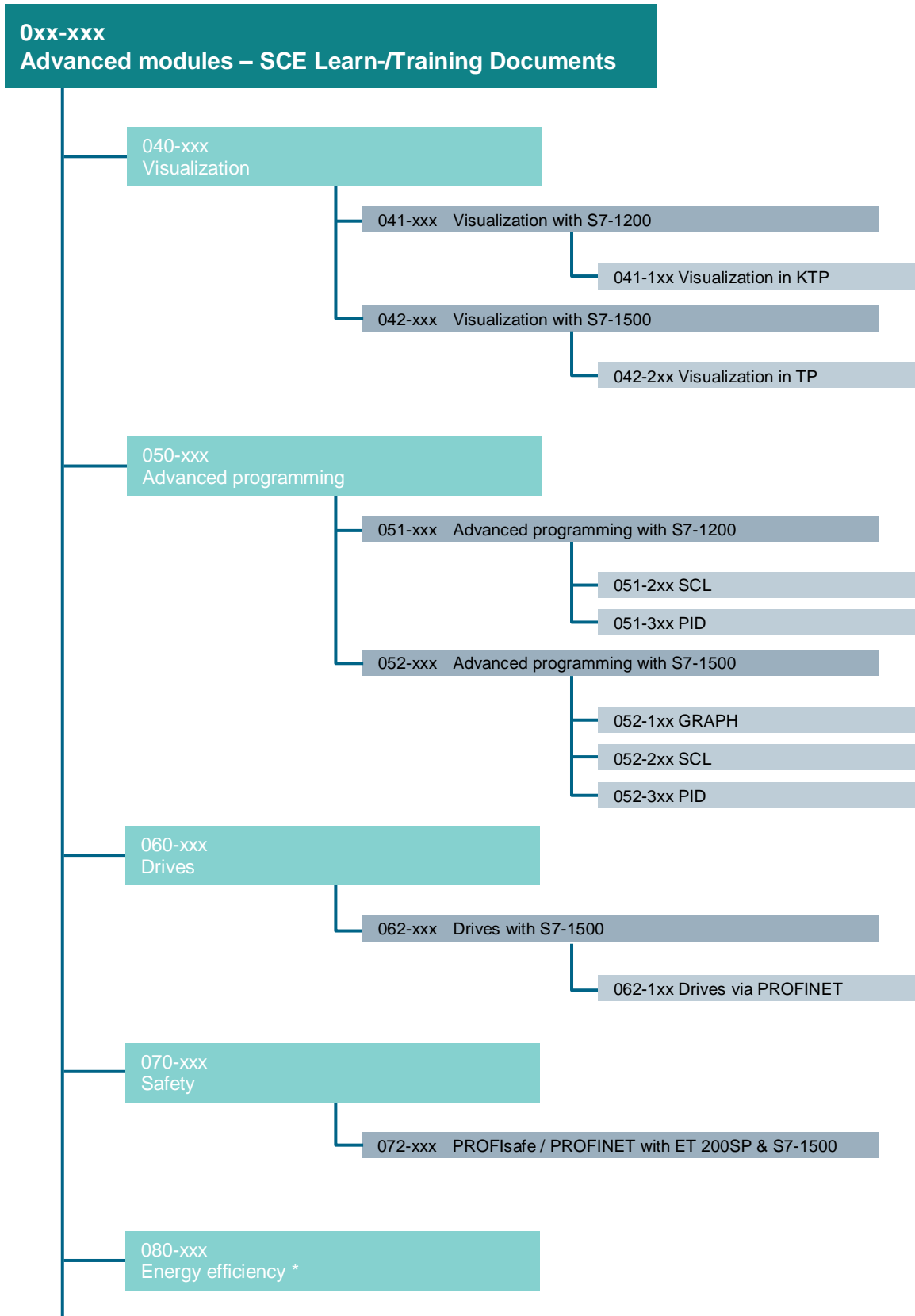
This topic is not a training unit. Instead, it describes example processes that are to be used in the subsequent chapters for specific tasks. To date, there is the sorting station example process. This will be used for programming in the modules of the example processes. The objective of SCE is to implement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

030-xxx Basics of PLC Programming

The "Basics of PLC Programming" topic is also subdivided into the S7-1200 and S7-1500 controllers and IOT2000EDU. Its purpose is to make it easier to get started. 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. Extremely 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, Drives, Safety, Advanced Communication, RFID, Security and Digital Twin. The following explains how these modules are structured.



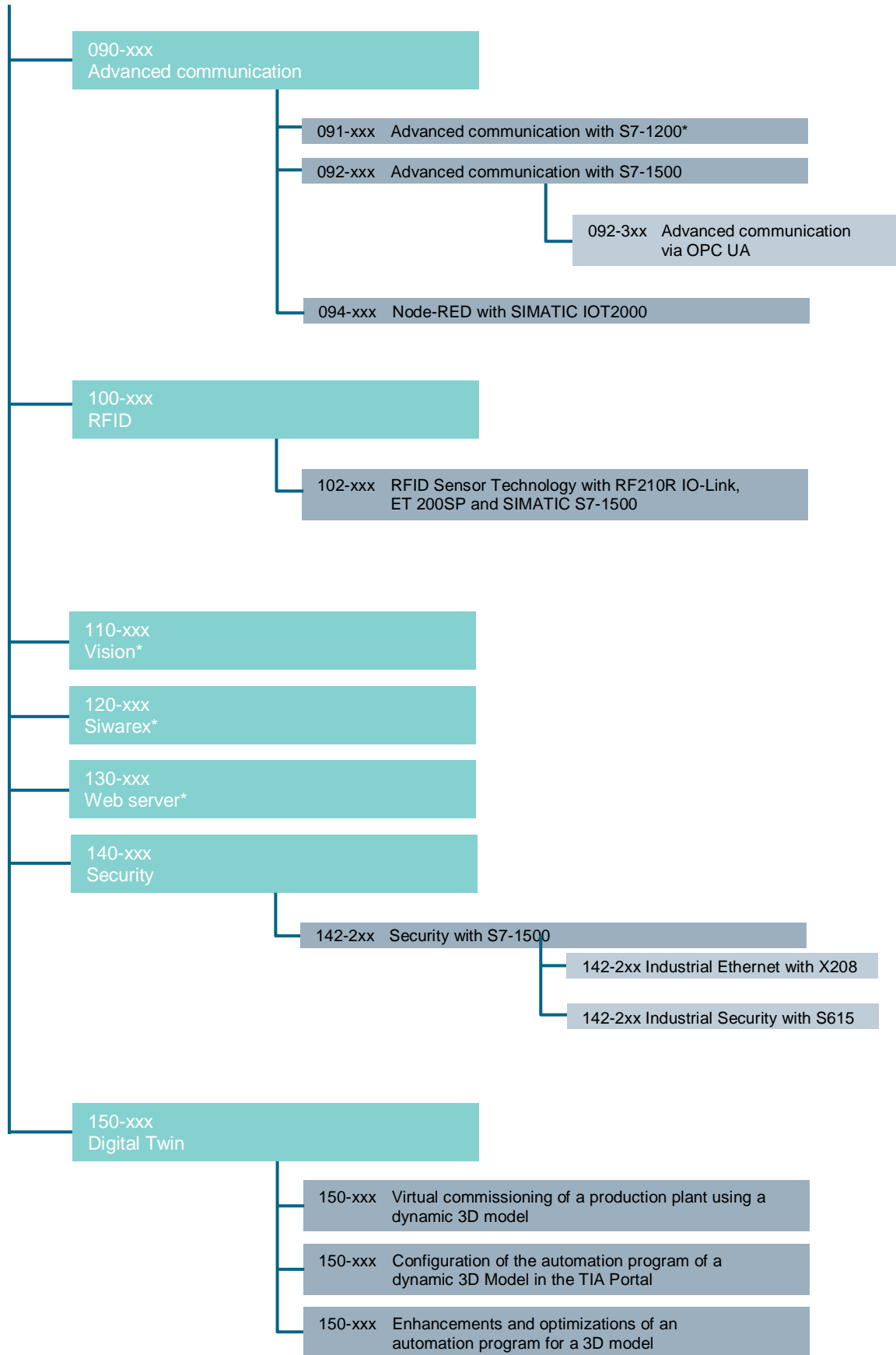


Figure 3: Overview of advanced modules

* Upcoming

Structure of the advanced modules

For the advanced modules, there is also a subdivision into the S7-1200 and S7-1500, S7-300 and IOT2000EDU controllers, but the contents with S7-1500 are preferably shown here. Contents for S7-1200 are available only when they differ significantly from that 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, for adding a panel and its configuration, simple visualizations and animations.

050-xxx Advanced Programming

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

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. Here, the protective door of a sorting station is to be monitored via PROFINET using a CPU 1516F-3 PN/DP as IO controller and an ET 200SP as 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 S7-1500 to other networks for Industrial Ethernet Switch SCALANCE XC208 and Industrial Ethernet Security SCALANCE S615.

150-xxx Digital Twin

Similar to all SCE training curriculums, 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 above-described modules are made available as SCE training curriculums.

Additional SCE learning and training material is available to assist in lesson planning or self-study. This includes the SIMIT model, which implements the example process as a simulation. The simulation can already be started with 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 plants, 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 materials. 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 are integrated as links within the SCE Learning & Training Document, e.g. videos and animations. These are also available via the SCE website or YouTube.

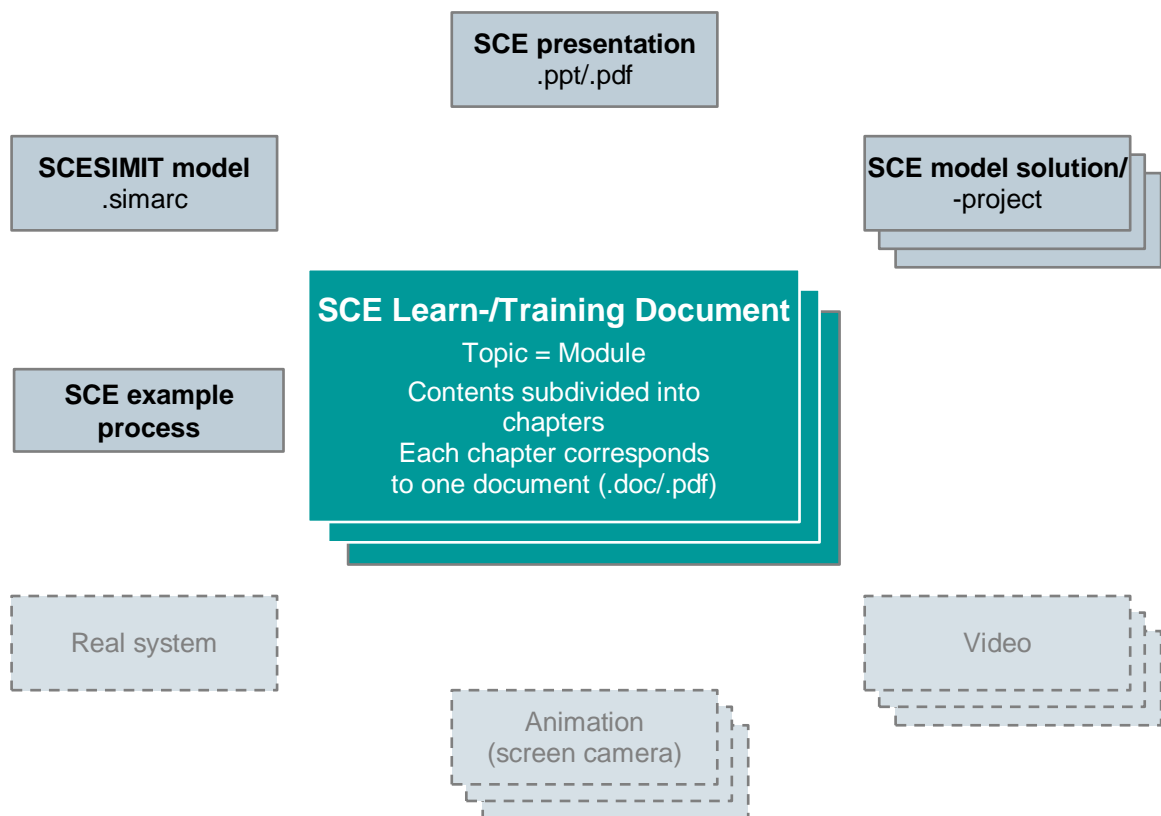


Figure 4: Overview of SCE learning and training material

2.2 Structure of the individual chapters based on the teaching methodology

At the core of the learning and training materials are the SCE training curriculums 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 then formulated, which is next planned and implemented using an example. The task is then implemented according to structured step-by-step instructions and verified using a checklist. The exercise follows, beginning with another task that is now to be planned and implemented independently. A checklist at the end enables learners to check their own solution.

The purpose of the exercise is to allow independent execution of a task. Only the task is specified. Planning and implementation (= execution) must take place independently. 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. Information on which chapters serve as the basis for a particular chapter can be found at the start of every module under "Prerequisites".

The chapters are structured within the concept described above.

The example process is to continuously accompany the learners so that understanding of 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 should be helpful by acting as an intermediary between the task and solution and a guide for planning the implementation.

The step-by-step instructions, which have been newly structured, have also been changed in 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 when they are already familiar with the action.

A final checklist at the end of the exercise again enables learners to check 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 can be tested and what needs to 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 steps of the step-by-step instructions have been carefully completed and allows them to successfully complete the module on their own.

The model project can also be used for comparison of the solution. The 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 what the module is based on, the model solution also contains other solutions, of course.

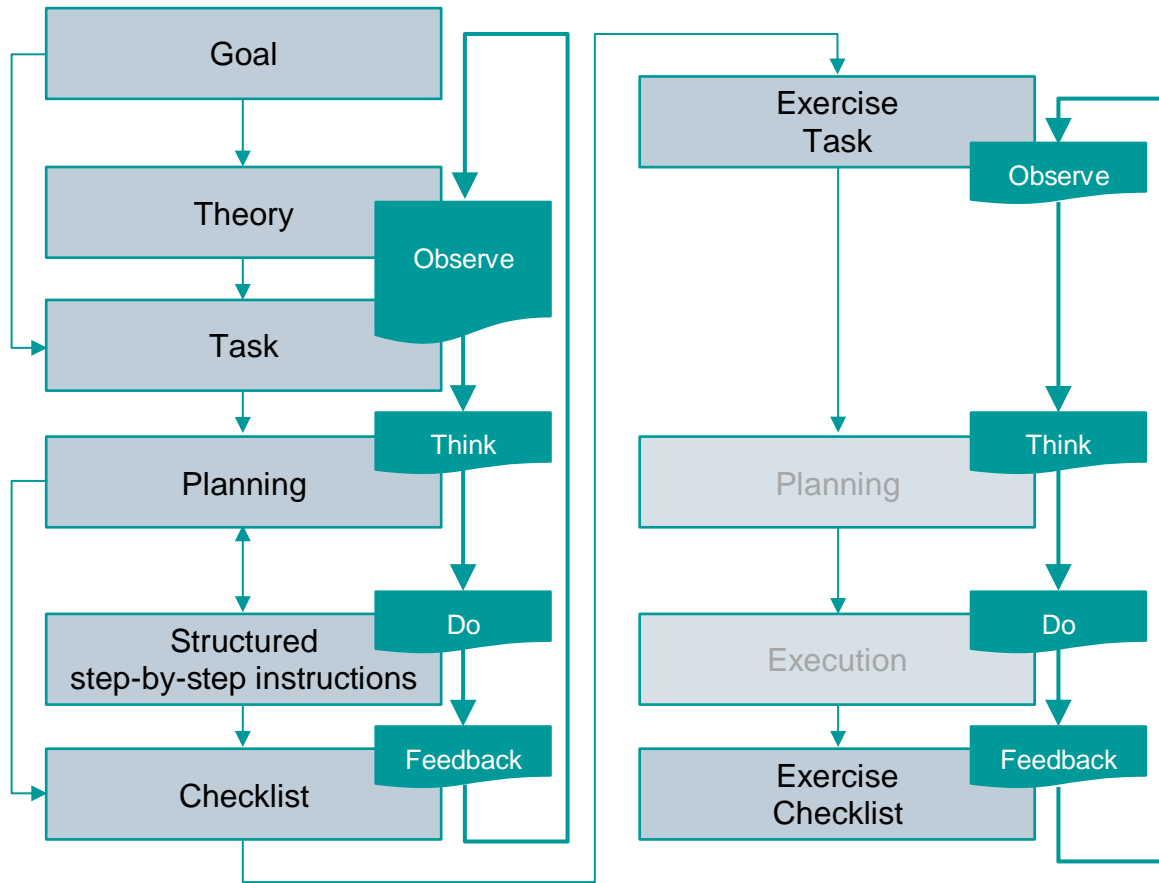


Figure 5: Structure of teaching methodology of the SCE training curriculums

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