

# ARM Microcontroller Course

June 3, 2015

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**1** The Course

2 Direct Digital Synthesis

3 Function Generator

# The course so far

What we did:

- Working with registers

What we will do today:

# The course so far

What we did:

- Working with registers
- Reading a datasheet

What we will do today:

# The course so far

What we did:

- Working with registers
- Reading a datasheet
- GPIO

What we will do today:

# The course so far

What we did:

- Working with registers
- Reading a datasheet
- GPIO
- Timers

What we will do today:

# The course so far

What we did:

- Working with registers
- Reading a datasheet
- GPIO
- Timers
- Analog peripherals

What we will do today:

# The course so far

What we did:

- Working with registers
- Reading a datasheet
- GPIO
- Timers
- Analog peripherals
- SPI

What we will do today:



# The course so far

## What we did:

- Working with registers
- Reading a datasheet
- GPIO
- Timers
- Analog peripherals
- SPI

## What we will do today:

- Combine the knowledge

# The course so far

## What we did:

- Working with registers
- Reading a datasheet
- GPIO
- Timers
- Analog peripherals
- SPI

## What we will do today:

- Combine the knowledge
- Build a function generator using DDS

# The course so far

## What we did:

- Working with registers
- Reading a datasheet
- GPIO
- Timers
- Analog peripherals
- SPI

## What we will do today:

- Combine the knowledge
- Build a function generator using DDS
- Get it to run fast!

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1 The Course

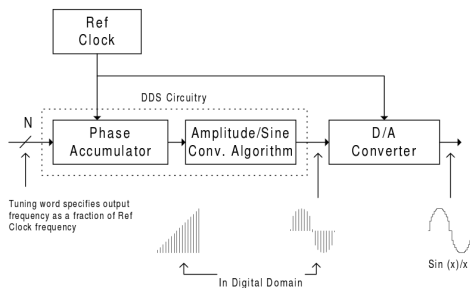
2 Direct Digital Synthesis

3 Function Generator

# Recap: DDS

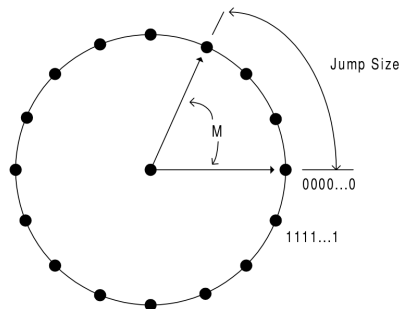
DDS consists of:

- Reference clock
- Tuning Word
- Phase Accumulator
- Phase to Amplitude algorithm



# Phase Accumulator

- Size of Phase Accumulator  $2^N$
- Jump size (tuning word)  $M$
- Reference clock  $f_s$



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# What to do today

Build a **Function Generator** Direct-Digital Synthesis.

The minimum consists off:

- Reference clock  $f_s$
- Magic word  $M$
- SPI to talk to DAC



# Material

You can find all material on  
<http://www.scintilla.utwente.nl/docs/cursus>  
Make sure you download:

- The Updated Manual (0603)
- The Usermanual of the Nucleo-F411RE
- The Reference Manual of the STM32F411RE
- Datasheet AD5611 DAC.

Optional:

- HAL document
- Programming Guide

## More on today

Around 23:00, we'll award a prize for the fastest sine wave.

**Good Luck!**