



SABIS

SABIS®
Mechatronics
3D Printing
Course Details

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**SABIS® Mechatronics 3D Printing
Course Details**



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Introduction

This document provides the details pertaining to the SABIS® Mechatronics 3D Printing course, including the course description and objectives, required hardware and software, and the respective pacing chart.

Course Description

In this course, students in levels L – N will learn the theoretical and practical knowledge of the transformative 3D printing technology for the future of design, architecture, and engineering. Students will be introduced to the fundamental materials and engineering science, best-known practices, and the use of CAD software to aid in the creation, analysis, and optimization of 3D printing.

The course consists of three modules that sequentially cover the history, science, engineering, and best-known practices of 3D printing. Within every session of the course, there are projects that require students to use the skills that they have just learned in order to demonstrate their mastery of the respective concepts.

In-depth lectures and class discussions with stimulating projects unlock the potential in every student to create, innovate, and fabricate.

Course Objectives

Upon completion of the SABIS® Mechatronics 3D printing course, students will:

- learn the basic and intermediate concepts to 3D print fully functional parts.
- be exposed to engineering practices through building solutions to real world problems, implement problem solving strategies, and learn to be efficient in a teamwork environment.
- understand the advantages and limitations of 3D printing.
- explain current and emerging 3D printing applications.
- identify opportunities to apply 3D printing technology.

Course Prerequisites

There are no pre-requisite courses nor prior 3D printing knowledge required to complete the course.



Course Curriculum

The SABIS® Mechatronics 3D printing course curriculum includes the following:

1. Step-by-step lessons in the form of Interactive White Board (IWB) PowerPoint Presentations as the main instructional material to be used during the course, including tutorial videos animations, and design guides.
These IWB lessons are self-contained and include built-in opportunities to self-assess progress, following the SABIS® teaching methodology.
2. A Mechatronics 3D printing book covering the full course content.
Note: This book should be printed and given to each group of students, and is only to be used during the course.
3. A pacing chart.

Course Delivery and Duration

The recommended course delivery is as an after-school club, taught in a lab-like environment. Students should have access to computers, and the 3D printer(s) to design and test their 3D printed objects.

This course is designed for students preferably in a group of 1 – 2 for every PC. And one 3D printer is sufficient to cater for a class of 10 to 15 students.

There is a total of 54 sessions in the SABIS® Mechatronics 3D printing course, with each lasting between 60 minutes and 90 minutes. The sessions are distributed as per the recommended pacing chart presented below.

The total time required to complete the course is approximately 27 weeks, assuming 2 sessions per week.



Course Logistics

Hardware

The necessary hardware to run the course are outlined below.

3D Printer

The 3D printed to be used is *Flashforge Creator Pro*
(<http://www.flashforge.com/creator-pro-3d-printer/>)

Filtration

The necessary filtration systems and filters needed as listed below.

- *Zimpure 2* source suction and filtration system from *Zimple 3D*, including compatible suction head (included with purchase of 3D printer)
(<https://www.zimple3d.com/zimpure/>)
- *Zimpure 2* additional gas and particle filters kit for replacements if 3D printer is used very frequently (*recommended*)

Filaments

The necessary eSUN filaments are found below.
(<http://www.esun3d.net/Products/3D-Filament>)

- PLA+ – White (weight = 1 kg)
- PVA – Natural (weight = 0.5 kg)
- TPE – elastic Red (weight = 1 kg)
- WOOD (weight = 0.5 kg)
- Copper – Natural (weight = 1 kg)

PC and Mouse

- One PC is needed for every group of 1 – 2 students, with the following minimum requirements.
 - Windows 8.1 or later with 64-bit version
 - 2.1 GHz processor
 - 4 GB RAM
 - 500 MB of free hard-disk space
 - 3D Class Video card (including 512 MB of memory or higher, and support for hardware acceleration)
 - SD card supported
- A 3-button, scroll-wheel mouse for ease of 3D model rotation, design, and drawing.



Other

- 3D print removal tool (such as spatula, blade, etc.) to easily get the prints off from the print bed.
- MicroSwiss MK10 hardened steel nozzle

Software

The necessary PC software to run the course are:

- *FlashPrint*
(Downloadable at: <https://www.flashforge.com/download-center>)
- *SketchUp 2017*
(Downloadable at: https://download.cnet.com/SketchUp-Make-64-bit-2017/3000-6677_4-77424197.html)



SABIS® Mechatronics 3D Printing – Pacing Chart

Week	Teaching Material Learning Points	
Week 1	Chapter 1: Introduction to 3D Printing	Chapter 1: Introduction to 3D Printing
Week 2	Chapter 1: Introduction to 3D Printing	Chapter 1: Introduction to 3D Printing
Week 3	Chapter 2: Design for 3D Printing LP 1 + LP 2	Chapter 2: Design for 3D Printing LP 2 + LP 3
Week 4	Chapter 2: Design for 3D Printing LP 4	Chapter 2: Design for 3D Printing LP 5 + LP 6
Week 5	Chapter 2: Design for 3D Printing LP 7	Chapter 2: Design for 3D Printing LP 8
Week 6	Chapter 2: Design for 3D Printing LP 9	Chapter 2: Design for 3D Printing LP 10
Week 7	Chapter 2: Design for 3D Printing LP 10	Chapter 2: Design for 3D Printing LP 11 + LP 12
Week 8	Chapter 2: Design for 3D Printing LP 13	Chapter 2: Design for 3D Printing LP 14

Week	Teaching Material Learning Points	
Week 9	Chapter 3: Fundamentals of 3D Printing	Chapter 3: Fundamentals of 3D Printing
Week 10	Chapter 3: Fundamentals of 3D Printing	Chapter 3: Fundamentals of 3D Printing
Week 11	Chapter 3 Fundamentals of 3D Printing	Chapter 3 Fundamentals of 3D Printing
Week 12	Chapter 3 Fundamentals of 3D Printing	Chapter 3 Fundamentals of 3D Printing



Week 13	Chapter 3 Fundamentals of 3D Printing	Chapter 3 Fundamentals of 3D Printing
Week 14	Chapter 3 Fundamentals of 3D Printing	Chapter 3 Fundamentals of 3D Printing
Week 15	Chapter 3 Fundamentals of 3D Printing	Chapter 3 Fundamentals of 3D Printing
Week 16	Chapter 3 Fundamentals of 3D Printing	Chapter 3 Fundamentals of 3D Printing
Week 17	Chapter 3 Fundamentals of 3D Printing	Chapter 3 Fundamentals of 3D Printing
Week 18	Chapter 4: Business in 3D printing LP 1	Chapter 4: Business in 3D printing LP 2

Week	Teaching Material Learning Points	
Week 20	Chapter 5: 3D Printing Projects Project I – Air gliders	Chapter 5: 3D Printing Projects Project I – Air gliders
Week 21	Chapter 5: 3D Printing Projects Project I – Air gliders	Chapter 5: 3D Printing Projects Project I – Air gliders
Week 22	Chapter 5: 3D Printing Projects Project II - Bridges	Chapter 5: 3D Printing Projects Project II - Bridges
Week 23	Chapter 5: 3D Printing Projects Project II - Bridges	Chapter 5: 3D Printing Projects Project II - Bridges
Week 24	Chapter 5: 3D Printing Projects Project III - Gripper	Chapter 5: 3D Printing Projects Project III - Gripper
Week 25	Chapter 5: 3D Printing Projects Project III - Gripper	Chapter 5: 3D Printing Projects Project III - Gripper
Week 26	Chapter 5: 3D Printing Projects Project IV – Fashion	Chapter 5: 3D Printing Projects Project IV – Fashion
Week 27	Chapter 5: 3D Printing Projects Project IV – Fashion	Chapter 5: 3D Printing Projects Project IV – Fashion