



Elements of Dialing

October 2024 to April 2025

General notes

The course is intended for people who are new to sundialing and who wish to learn some of the basic concepts and a little bit of the history. The course is 'self study' – participants receive lessons by email and study them in their spare time.

As the course proceeds, there are regular but optional online meetings¹, using Zoom. They give participants the opportunity to discuss the course material and ask questions of the instructor. As well, the instructor is available via email to answer inquiries.

Each of the twelve lessons includes a few practice questions, one of which is a quiz question. Participants must send in an answer to the quiz question in order to receive the next lesson. There is no 'pass/fail' in this course but sending answers to the quiz questions allows the instructor to be sure that the course is proceeding successfully.

Awareness of general math at high school level is helpful; the first lesson includes a short review of the basic principles of trigonometry.

This is the fourth instance of the course. This time, the course facilitator will be Steve Lelievre (steve.lelievre.canada@gmail.com.) Contact Steve no later than October 26, 2024, for more information or to join the course.

The course is inspired by, and loosely based on, the original Dutch version created by Frans Maes.

Schedule

The course follows a 2-week cycle, but note that sometimes a week is skipped (highlighted).

Lesson	Lesson sent out by email	Deadline to submit answer to quiz question	NASS solutions to practice questions sent out	Office Hours (Zoom)
1	2024-10-28 Mon	2024-11-03 Sun	2024-11-05 Tue	2024-11-09 Sat
2	2024-11-11 Mon	2024-11-17 Sun	2024-11-19 Tue	2024-11-24 Sun
3	2024-11-25 Mon	2024-12-01 Sun	2024-12-03 Tue	2024-12-07 Sat
4	2024-12-09 Mon	2024-12-15 Sun	2024-12-17 Tue	2025-01-05 Sun
5	2025-01-06 Mon	2025-01-12 Sun	2025-01-14 Tue	2025-01-18 Sat
6	2025-01-20 Mon	2025-01-26 Sun	2025-01-28 Tue	2025-02-02 Sun
7	2025-02-03 Mon	2025-02-09 Sun	2025-02-11 Tue	2025-02-15 Sat
8	2025-02-17 Mon	2025-02-23 Sun	2025-02-25 Tue	2025-03-02 Sun
9	2025-03-03 Mon	2025-03-09 Sun	2025-03-11 Tue	2025-03-15 Sat
10	2025-03-17 Mon	2025-03-23 Sun	2025-03-25 Tue	2025-03-30 Sun
11	2025-03-31 Mon	2025-04-06 Sun	2025-04-08 Tue	2025-04-12 Sat
12	2025-04-14 Mon	2025-04-27 Sun	2025-04-29 Tue	2025-04-27 Sun

Office Hours will always start at 3 p.m. Eastern Time. Quiz deadlines are midnight Eastern Time.

¹ Privacy Notice: The Zoom meetings will be recorded. The recording will be made available to all course participants.

Course Outline

1	<p><i>Location of the sun in the sky</i></p> <p>We discuss solar altitude, the local meridian and solar azimuth, graphs of the sun's altitude versus azimuth.</p> <p>Review of basic concepts of trigonometry.</p>
2	<p><i>Orientation on the globe</i></p> <p>We consider the coverage of sunlight on the globe.</p> <p>How to define a location by use of geographical coordinates: latitude and longitude.</p>
3	<p><i>The earth as a sundial</i></p> <p>We look at the rotating earth and pole-style sundials, and introduce the solar hour angle and measurement of time using the equatorial sundial. The armillary sphere represents a view of the celestial sphere and the sun's path.</p>
4	<p><i>Earth and sun</i></p> <p>Some details of the earth's rotation about its axis, the orbit of the earth, and terms to describe where the sun is on the Celestial Sphere. These terms include solar declination, ecliptic, zodiac, declination and date, and declination and solar altitude.</p> <p>A bit more trigonometry and equations for azimuth and altitude are covered.</p> <p>Tables of the sun's declination and the cause of the sun's poor timekeeping are explained, along with how to use the Equation of Time (EoT).</p>
5	<p>We explore seven major dial orientations using the BSS Educational Multi-Dial kit: horizontal dials, direct south and north vertical dials, equatorial dials, polar dials, direct east and west vertical dials; declining vertical dials, inclining dials; pocket dials (Augsburg, Butterfield, diptych); compound dials.</p> <p>A look at small portable timepieces: Butterfield dial, Diptych, and other types; examples of beautiful work from the historical sundial making centers of Augsburg, Nuremberg, and other locations.</p>
6	<p><i>What is a gnomon</i></p> <p>Sundials use a variety of shadow casting devices including vertical poles and slanted gnomons. Wide gnomons have a 'noon gap'. We introduce the concept of the shadow plane and hour plane and learn how to construct the hour lines for polar dials, horizontal dials, direct south-facing vertical dials, and with a bit more complexity, declining vertical dials; shadow plane dials, and what happens when moving a sundial to another location.</p> <p>Measuring wall declination.</p>
7	<p><i>Date lines</i></p> <p>A nodus, an index point on the gnomon, creates a mark on the shadow that allows us interpret date lines. The most common are the lines for summer and winter solstice and a straight line for the equinox. We look at other date lines, and date lines as they appear on vertical declining dials, Plus the horizon line, altitude, and azimuth lines.</p>

8	<p><i>Sun and clock</i></p> <p>The Equation of Time (EoT) is easy to define but hard to compute. We'll look at solar time, mean local time, time zones, the origins of the EoT (with a nod to Johannes Kepler for showing the orbit of the earth is an ellipse). But nothing is easy, and the axis of the earth is tilted relative to the orbital plane, adding a complication to the EoT.</p>
9	<p><i>Non-planar pole-style dials</i></p> <p>Spherical dials, terrellae, the hollow sphere, polar cylinder dial, cylinder dial without style, vertical cylinder dial, diverse dial faces.</p>
10	<p><i>Other sundial types</i></p> <p>Azimuth dials: analemmatic dial, sun compass, equator projection dial, azimuth dial with fixed gnomon.</p> <p>Altitude dials: cylinder or shepherd's dial, farmer's ring, universal equatorial dial, quadrant, navicula, Regiomontanus dial.</p> <p>Some other types: self-orienting combination, digital dial.</p>
11	<p><i>Historical development</i></p> <p>Antique hours from Babylonia, altitude dial from Egypt, the Arab connection.</p> <p>Dials from Medieval times: canonical dial.</p> <p>The Renaissance and later: equal hours, meridian lines, Babylonian and Italian hours, heliochronometers, bifilar dials, monofilar dials.</p>
12	<p><i>Miscellaneous</i></p> <p>Special sundials: reflection dials.</p> <p>Sundials in art: sundials carried by figures, the sun pointer.</p> <p>Moon dials and nocturnals.</p> <p>Accuracy of sundials: constructive accuracy, reading accuracy, disappearing shadows; atmospheric effects: refraction, twilight.</p> <p>Mottoes and other dial furniture.</p>

END