

Syllabus for Community Science Academy 3

Held at Caltech from June 18 to July 27, 10 am to 3:30 pm, Mon/Wed/Fridays

Students can arrive any time after 9 am. Please account for time you may need to clean before exiting.

Week 1: Digital signals and sensors

| Monday, June 18 | | |
|---------------------|----------|--|
| 10:00 am – 11:30 am | Spalding | Safety lecture and lab tour -- <i>closed-toed shoes, long pants, no contact lenses, hair up!</i> |
| 11:30 am – 12:30 pm | CTLO | Lunch |
| 12:30 pm – 1:30 pm | Spalding | How noses work |
| 1:30 pm – 3:30 pm | Spalding | Your first electronic nose |

| Wednesday, June 20 | | |
|---------------------|----------|--------------------------------------|
| 10:00 am – 11:30 am | Spalding | Review of circuits |
| 11:30 am – 12:30 pm | CTLO | Lunch |
| 12:30 pm – 2:00 pm | Spalding | Resistance and voltage dividers |
| 2:00 pm – 3:30 pm | Spalding | Humanities 1: food and drink testing |

| Friday, June 22 | | |
|---------------------|----------|-----------------------------|
| 10:00 am – 11:30 am | Spalding | Amplifying a signal |
| 11:30 am – 12:30 pm | CTLO | Lunch |
| 12:30 pm – 3:30 pm | Spalding | Optical telegraph challenge |

Week 2: Digital signals and sensors (continued)

| Monday, June 25 | | |
|---------------------|----------|---|
| 10:00 am – 11:30 am | Spalding | Analog to digital conversion |
| 11:30 am – 12:30 pm | CTLO | Lunch |
| 12:30 pm – 2:00 pm | Spalding | Building an A/D converter |
| 2:00 pm – 3:30 pm | Spalding | Students create video explanations of core concepts |

| Wednesday, June 27 | | |
|---------------------|----------|---|
| 10:00 am – 11:30 am | Spalding | Humanities 2: Create a novel cookie and packaging |
| 11:30 am – 12:30 pm | CTLO | Lunch |
| 12:30 pm – 3:30 pm | Spalding | Project: portable chemical detector |

| Friday, June 29 | | |
|---------------------|----------|-------------------------------------|
| 10:00 am – 11:30 am | Spalding | Project: portable chemical detector |
| 11:30 am – 12:30 pm | CTLO | Lunch |
| 12:30 pm – 3:30 pm | Spalding | Project: portable chemical detector |

Week 3: Microcontroller integration

| Monday, July 2 | | |
|---------------------|----------|---|
| 10:00 am – 11:30 am | Spalding | Preparing chemical detector presentations |
| 11:30 am – 12:30 pm | CTLO | Lunch + chemical detector presentations |
| 12:30 pm – 3:30 pm | Spalding | Arduino review + experimentation |

| Tuesday, July 3 | | |
|---------------------|----------|---|
| 10:00 am – 11:30 am | Spalding | Project: Computerized chemical detector |
| 11:30 am – 12:30 pm | CTLO | Lunch |
| 12:30 pm – 2:00 pm | Spalding | Project: Computerized chemical detector |
| 2:00 pm – 3:30 pm | Spalding | Humanities 3: Ideating uses for your E-Nose |

| Friday, July 6 | | |
|---------------------|----------|---|
| 10:00 am – 11:30 am | Spalding | Project: Computerized chemical detector |
| 11:30 am – 12:30 pm | CTLO | Lunch |
| 12:30 pm – 3:30 pm | Spalding | Project: Computerized chemical detector + presentations |

Week 4: Chemistry

| Monday, July 9 | | |
|---------------------|----------|--|
| 10:00 am – 11:30 am | Spalding | Flavor molecules and functional groups |
| 11:30 am – 12:30 pm | CTLO | Lunch |
| 12:30 pm – 2:00 pm | Spalding | Molecular recognition and binding |
| 2:00 pm – 3:30 pm | Spalding | Introduction to polymers: nylon experiment |

| Wednesday, July 11 | | |
|---------------------|----------|---------------------------------------|
| 10:00 am – 11:30 am | Spalding | Instant snow and molecular gastronomy |
| 11:30 am – 12:30 am | CTLO | Lunch |
| 12:30 pm – 1:30 pm | Spalding | Molecular thermodynamics |
| 1:30 pm – 3:30 pm | Spalding | Polymer dissolving trials |

| Friday, July 13 (Career Day) | | |
|------------------------------|----------|--|
| 10:00 am – 11:30 am | Spalding | Career seminar (joint with SRC) |
| 11:30 am – 12:30 pm | CTLO | Lunch |
| 12:30 pm – 2:00 pm | Spalding | Humanities 4: Needs board for proposed product |
| 2:00 pm – 3:30 pm | Spalding | Humanities 5: Product mock-up |

Week 5: Final project

| Monday, July 16 (Calibration day) | | |
|-----------------------------------|----------|---|
| 10:00 am – 11:30 am | Spalding | Dew point generator + reference humidity sensor |
| 11:30 am – 12:30 pm | CTLO | Lunch |
| 12:30 pm – 2:00 pm | Spalding | Making a humidity sensor |
| 2:00 pm – 3:30 pm | Spalding | Quantifying resistance versus humidity |

| Wednesday, July 18 | | |
|---------------------|----------|---|
| 10:00 am – 11:15 am | Spalding | Final project: custom molecular sensor |
| 11:30 am – 12:30 pm | Mead | Lunch & Caltech faculty seminar (joint with SRC) |
| 12:45 pm – 1:30 pm | Spalding | Final project: custom molecular sensor |

| Friday, July 20 | | |
|---------------------|----------|--|
| 10:00 am – 11:30 am | Spalding | Final project: custom molecular sensor |
| 11:30 am – 12:30 pm | Mead | Lunch |
| 12:30 pm – 3:30 pm | Spalding | Final project: custom molecular sensor |

Week 6: Final project (continued)

| Monday, July 23 | | |
|---------------------|----------|--|
| 10:00 am – 11:30 am | Spalding | Final project: custom molecular sensor |
| 11:30 am – 12:30 pm | Mead | Lunch |
| 12:30 pm – 3:30 pm | Spalding | Final project: custom molecular sensor |

| Wednesday, July 25 | | |
|--------------------|----------|--|
| 10:00 am – noon | Spalding | Final project: custom molecular sensor |
| Noon – 1 pm | Mead | Lunch |
| 1 pm – 3:30 pm | Spalding | Final project: custom molecular sensor |

| Friday, July 27 | | |
|---------------------|----------|--|
| 10:00 am – 11:30 am | Spalding | Final project: custom molecular sensor |
| 11:30 am – 12:30 pm | Mead | Lunch |
| 12:30 pm – 2:00 pm | Spalding | Final project: custom molecular sensor |
| 2:00 pm – 3:30 pm | CTLO | Presentations + final wrap-up and graduation |