Boston University Summer Term Pre-College Programs

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Pre-College Course Innovation with Summer Term

For Summer 2027 and beyond, Summer Term Pre-College would like to expand and refresh its course offerings on a regular basis, to ensure that we are meeting the needs and interests of intellectually curious high school students who want to learn more about current and emerging fields of study. For 2027, we seek to develop new offerings for our Academic Immersion (AIM) and Summer Challenge programs.

Course Idea: New Interdisciplinary Health Sciences course

Here is a sample outline for an interdisciplinary Health Sciences course that we are interested in for 2027 primarily for our AIM (three-week) program.

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The AIM program is ideally structured to provide an engaged, interdisciplinary university seminar-style experience. Given the strong demand for courses in the pre-med area among this age group, we have an opportunity to develop a new offering that embraces "convergent" research and education, in keeping with current BU strategic priorities.

The idea: Students learn core biomedical science, then repeatedly confront the question, "How do we use that science to make decisions about individual and population health?" The organizing framework would be **Science → Medicine → Society**, with a case-based approach throughout.

Course concept

Possible title: *Introduction to Health Sciences: From Biology to Public Policy*

Length: 3 weeks / 14 instructional days, Monday–Friday (Academic Immersion). A more pared down version could also be piloted for 2 weeks, 18 instructional hours (Summer Challenge), if instructor availability is more limited.

Audience: Academically talented students ages 15–17; no prior coursework beyond typical high-school biology/chemistry assumed for SC, but we could make it more selective (such as setting the pre-requisite as AP or Honors Biology) for Academic Immersion if we wanted to.

Central framing question: How do science, medicine, ethics, and public policy interact to determine who gets healthy, who gets sick, and what we do about it?

Learning Outcomes: By the end of the course, students will be able to:

- explain foundational concepts in human health and disease
- interpret basic clinical and public-health data
- understand how evidence moves from laboratory research to clinical care

- analyze health questions from scientific, ethical, social, and policy perspectives
- construct an evidence-based response to a complex health problem.

Sample Outline

Here is a sample outline of potential topics for a three-week AIM course designed with this mix of themes in mind. We took our basic idea and asked ChatGPT just to provide a 14-day example – instructors are more than welcome to develop their own structure and content!

Week 1 — Understanding Health and Disease

Day	Theme	Key Topics	Possible Activities
1	**What Is Health Science?**	Defining health and disease; biomedical vs. population health; determinants of health; introduction to epidemiology	Analyze contrasting patient/community cases; students construct a "map" of factors affecting health
2	**The Human Body as a System**	Homeostasis; physiology; organ systems; genetics/environment interactions	Physiology lab: heart rate, blood pressure, respiratory rate; experimental design exercise
3	**Cells, Genes & Disease**	DNA, mutation, gene expression; inherited vs. acquired disease; genomics and personalized medicine	Genetic-disease case study; pedigree analysis; optional DNA extraction/lab
4	**Pathogens & the Immune System**	Bacteria, viruses, immunity, vaccines; antimicrobial resistance	Outbreak simulation; bacterial culture/microscopy if facilities permit
5	**How Do We Know a Treatment Works?**	Scientific method; clinical trials; placebo/control groups; correlation vs. causation; risk	Students evaluate competing claims about a treatment and design a hypothetical clinical trial

Week 1 case: A new infectious disease appears in a community. Students gradually receive laboratory, patient, and epidemiological information and determine what they think is happening.

Week 2 — Medicine, Technology & Ethical Decision-Making

This week moves from *how disease works* to *what medicine can—and should—do about it.*

Day	Theme	Key Topics	Possible Activities
6	**Diagnosis: How Doctors Solve Problems**	Symptoms vs. signs; differential diagnosis; laboratory tests; imaging; sensitivity/specificity	Students work through a clinical mystery in teams; interpret simplified labs and imaging
7	**Treatment & Pharmacology**	How drugs work; dose-response; side effects; drug development; antibiotics; resistance	Dose-response/data-analysis lab; drug-development simulation
8	**Medical Technology & the Future of Medicine**	AI, medical imaging, robotics, gene therapy, CRISPR, precision medicine	Teams evaluate an emerging technology; guest researcher/physician
9	**Bioethics: Just Because We Can, Should We?**	Autonomy, beneficence, non-maleficence, justice; informed consent; confidentiality	Structured ethics debate using cases: gene editing, organ transplantation, experimental treatments, etc.
10	**Health Disparities & Social Determinants of Health**	Race/ethnicity, income, geography, environment, education; access to care; health outcomes	Compare health outcomes across Boston neighborhoods or U.S. communities; map/data exercise

Week 2 case: Students consider a potentially lifesaving new medical technology that is extremely expensive. Who should receive it? Who should pay? This provides a natural bridge from biomedical science to ethics and policy.

Week 3 — From Individual Health to Public Health

The final week expands the lens from the patient to populations and asks students to make policy decisions using scientific evidence.

Day	Theme	Key Topics	Possible Activities
11	**Epidemiology & Public Health**	Incidence/prevalence; risk factors; surveillance; outbreak investigation	Hands-on outbreak investigation using a dataset; calculate attack rates and identify source
12	**Who Pays for Health?**	Basics of the U.S. healthcare system; insurance; cost; access; comparisons with other systems	Students follow fictional patients through different healthcare scenarios; policy trade-off exercise

Day	Theme	Key Topics	Possible Activities
13	**Public Health Policy: Individual Choice vs. Collective Good**	Vaccination, smoking/vaping, obesity, infectious disease, environmental health; government authority	Mock public-health advisory committee or legislative hearing
14	**Health Challenge Summit**	Integration of science, medicine, ethics and policy	Final team presentations followed by peer/expert questioning and course synthesis

Final Project

Idea 1:

Rather than a conventional final exam, the course would culminate in a **Health Challenge Project**.

Early in the course, teams choose—or are assigned—a contemporary health challenge such as antibiotic resistance, adolescent mental health, obesity/diabetes, Alzheimer's disease, vaccine hesitancy, opioid use, maternal mortality, environmental health, organ transplantation, or access to gene therapy.

They investigate the same problem through four lenses:

- **Science:** What biological mechanisms cause the problem?
- **Clinical medicine:** How is it diagnosed, prevented or treated?
- **Ethics:** What competing values or ethical questions arise?
- **Policy/public health:** What should institutions or governments do?

On the last day, teams could present to a simulated **Health Policy Advisory Board**. Rather than simply giving a research presentation, they have to make a recommendation and defend it under questioning.

Idea 2:

Focus on **one evolving case across all three weeks**, which might reflect the main instructor's area of specialization. For example, an emerging infectious disease can begin as a cell biology/immunology problem in Week 1, become a clinical trial and bioethics problem in Week 2, and become an epidemiology, access, and government-policy problem in Week 3. That would give the 14 days a compelling intellectual through-line rather than making them feel like 14 separate health-science topics.

Additional ways to make the course distinctly multidisciplinary

One advantage of this design is that it doesn't necessarily require a single faculty member to be expert in everything. A lead instructor could provide continuity while bringing in specialists—for

example, a molecular biologist for genetics, physician for clinical diagnosis, epidemiologist for outbreak science, bioethicist for Day 9, health-policy scholar for Day 12, and public-health practitioner for Day 13. If we choose this path, it would require someone with a strong network across campus, or someone willing to seek out and bring on board appropriate contributors.

Particularly for the AIM program, with its more robust structure and experiential focus, we will want/need to build in **2–3 experiences outside the classroom**: a research laboratory visit, medical simulation center, hospital/clinical research environment, public-health agency, or a faculty research presentation designed specifically for the students.