CAS/GRS New Course Proposal Form

This form is to be used when proposing a new CAS or GRS course.

This form should be submitted in hard copy to Senior Academic Administrator Peter Law (617-353-7243) in CAS Room 106 or as a PDF file to pgl@bu.edu. For further information or assistance, contact Associate Dean Susan Jackson (617-353-2410; sjackson@bu.edu).

DEPARTMENT OR PROGRAM: Department of Biology DATE SUBMITTED: 10/14/14

COURSE NUMBER: CAS BI 411/GRS BI 611

COURSE TITLE: “Microbiome – our intimate relationship with microorganisms”

INSTRUCTOR(S): Horacio Frydman

TO BE FIRST OFFERED: Sem./Year: __Spring___ / ____2015____

SHORT TITLE: The “short title” appears in the course inventory, on the Link University Class Schedule, and on student transcripts and must be 15 characters maximum including spaces. It should be as clear as possible.

M | I | C | R | O | B | I | O | M | E

COURSE DESCRIPTION: This is the description that appears in the CAS and/or GRS Bulletin and is the first guide that students have as to what the course is about. The description can contain no more than 40 words.

The microbial community – referred to as “microbiome” – that colonizes our body plays an important role in our health. Topics include (1) the human microbiome; and (2) fundamental aspects of the interactions between animals and the microorganisms that reside on them.

PREREQUISITES: Indicate “None” or list all elements of the prerequisites, clearly indicating “AND” or “OR” where appropriate. Here are three examples: “Junior standing or CAS ZN300 or consent of instructor”; “CAS ZN108 and CAS ZN203 and CAS PQ206; or consent of instructor”; “For SED students only.”

1. State the prerequisites:
   CASBI 203 – Cell Biology (CM) or equivalent
   CASBI 206 – Genetics (CM) or equivalent
   CAS BI 311 – General Microbiology or consent of the instructor

2. Explain the need for these prerequisites:
   This class will require reading of scientific papers from research journals, which will require an understanding of the fundamentals of Cell Biology and Genetics. A basic understanding of microbiology is helpful but not
essential. Students will be given readings and will be lectured on basic fundamental principles of microbiology during the first few lectures of the semesters.

Note: 203 and 206 are prereqs for BI 311

CREDITS: (check one)
☐ Half course: 2 credits   ☐ Variable: Please describe.
☒ Full course: 4 credits   ☐ Other: Please describe.

DIVISIONAL STUDIES CREDIT: Is this course intended to fulfill Divisional Studies requirements?
☒ No
☐ Yes. If yes, please indicate which division ____________________ and explain why the course should qualify for Divisional Studies credit:

HOW FREQUENTLY WILL THE COURSE BE OFFERED?
☐ Every semester  ☐ Once a year, fall  ☒ Once a year, spring  ☐ Every other year
☐ Other: Explain:

NEED FOR THE COURSE: Explain the need for the course and its intended impact. What is the relationship of this course to the curriculum in your department/program, in other departments/programs, in CAS or other schools and colleges? Which students are most likely to be served by this course? (You must attach appropriate cognate comments using cognate comment form if this course is intended to serve students in specific other programs. See FURTHER INFORMATION below about cognate comment.)

The recent advance in sequencing technology has revealed an astonishing diversity and ubiquity of the microbial world. It is also changing the biological view of a multicellular organism. For instance, the living creatures that we know as an individual organism (plant or animal), are in fact an association of a macroscopic host in a synergistic interdependence with numerous microorganisms, including bacteria, fungi and eukaryotic species. Recent data show that these microbial communities can have a profound importance on animal (including human) and plant evolution, development, metabolism, physiology, immunity, health and disease states. Currently, the microbiome research is a large multidisciplinary effort involving researchers from the fields just mentioned above and experts in other disciplines, including genomics, bioinformatics and microbiology. Despite this multidisciplinary effort, our understanding of these microbial communities interactions with the animal host is still very limited and it will be a central research theme in the years to come. Boston University students that aim to become future professionals in the fields of biology, biotechnology, public health and medicine should have a solid foundation in the exciting emerging interdisciplinary field of the microbiome. Knowledge arising from this field is transforming our view of the biological world and will have a profound impact in the practice of medicine.

ENROLLMENT: How many undergraduate and/or graduate students do you expect to enroll in the initial offering of this course?
CROSS-LISTING: Is this course to be cross-listed or taught with another course? If so, specify. Chairs/directors of all cross-listing units must co-sign this proposal on the signature line below.

OVERLAP:

1. Are there courses in the Course Inventory (CC00) with the same number and/or title as this course X No.
   
   ☐ Yes. If yes, any active course(s) with the same number or title as the proposed course will be phased out upon approval of this proposal.

2. Relationship to other courses in your program or others: Is there any significant overlap between this course and others offered by your department/program or by others? (You must attach appropriate cognate comments using cognate comment form if this course might be perceived as overlapping with courses in another department/program. See FURTHER INFORMATION below.)

No significant overlap with other courses. Related course is Microbiology (BI 311). The proposed microbiome course complements this class and extends coverage of the topic well beyond what students get in BI 311.

FACILITIES AND EQUIPMENT: What, if any, are the new or special facilities or equipment needs of the course (e.g., laboratory, library, instructional technology, consumables)? Are currently available facilities, equipment, and other resources adequate for the proposed course? (NOTE: Approval of proposed course does not imply commitment to new resources to support the course on the part of CAS.)

No.

STAFFING: How will the staffing of this course, in terms of faculty and, where relevant, teaching fellows, affect staffing support for other courses? For example, are there other courses that will not be taught as often as now? Is the staffing of this course the result of recent or expected expansion of faculty? (NOTE: Approval of proposed course does not imply commitment to new resources to support the course on the part of CAS.)

Staffing will be one primary instructor. No teaching fellow necessary.

BUDGET AND COST: What, if any, are the other new budgetary needs or implications related to the start-up or continued offering of this course? If start-up or continuation of the course will entail costs not already discussed, identify them and how you expect to cover them. (NOTE: Approval of proposed course does not imply commitment to new resources to support the course on the part of CAS.)

No.
EXTERNAL PROGRAMS: If this course is being offered at an external program/campus, please provide a brief description of that program and attach a curriculum vitae for the proposed instructor.

FURTHER INFORMATION THAT MUST BE ATTACHED IN ORDER FOR THIS PROPOSAL TO BE CONSIDERED:

1. A complete week-by-week SYLLABUS with readings and assignments that reflects the specifications of the course described in this proposal; that is, appropriate level, credits, etc. (See guidelines on "Writing a Syllabus" at http://www.bu.edu/ceit/teaching-resources/writing-a-syllabus/.)

2. Cognate comment from chairs or directors of relevant departments and/or programs. Use the form at http://www.bu.edu/cas/pdfs/faculty-staff/cognatecomment.doc. You can consult with Associate Dean Susan Jackson to determine which departments or programs inside and outside of CAS would be appropriate.

DEPARTMENT CONTACT NAME AND POSITION:  

DEPARTMENT CONTACT EMAIL AND PHONE:  

DEPARTMENT APPROVAL:  

Department Chair  

Date  

Other Department Chair(s) (for cross-listed courses)  

Date  

DEAN'S OFFICE CURRICULUM ADMINISTRATOR USE ONLY

CAS/GRS CURRICULUM COMMITTEE APPROVAL:  

☐ Approved Date:  

☐ Tabled Date:  

☐ Not Approved Date:  

Divisional Studies Credit:  

☐ Endorsed  

☐ HU  

☐ MCS  

☐ NS  

☐ SS  

☐ Not endorsed

Curriculum Committee Chair Signature and Date
Comments:

PROVISIONAL APPROVAL REQUESTED for Semester/Year ______________________________________

__________________________ Dean of Arts & Sciences Signature and Date

Comments:

CAS FACULTY: Faculty Meeting Date: ____________________ □ Approved □ Not Approved

__________________________ Curriculum Administrator Signature and Date

Comments:
CAS BI 411 – 611 Microbiome – Our Intimate Relationship with Microorganisms

Overview
There are 10 to 100 times more bacterial cells inhabiting our bodies than actual human cells. Indeed, this abundant and diverse population of microbes – referred to as the “microbiome” – that colonizes our bodies plays an important role in maintaining our health. Topics will include the evolutionary, ecological, cellular and molecular aspects of the interactions between animals and the bacterial communities that have evolved with them.

Professor
Horacio Frydman
Room 507, 24 Cummington St.
E mail: hfrydman@bu.edu

Time/Place

Tuesday 3:30 – 5:00 PM
Thursday 3:30 – 6:00 PM

LSE 504, 24 Cummington St (Conference Room at the 5th floor)

Reading material: Scientific papers will be made available to the students throughout the course

Grading:
Students will be graded on their oral presentations, discussions, participation and exams. Graduate students will also be required to write a research proposal that will be developed, presented and critiqued with the class during the semester.

Undergraduate grading:
Midterm Exam = 30%
Oral Presentation and Discussion = 20%
Final Exam = 40%
Participation = 10%

Graduate grading:
Midterm Exam = 20%
Oral Presentations and Discussion = 20%
Final Exam = 30%
Participation = 10%
Research Proposal = 20%

Undergraduate Prerequisites:
CASBI 203 – Cell Biology (CM) or equivalent
CASBI 206 – Genetics (CM) or equivalent
CAS BI 311 – General Microbiology or consent of the instructor

Graduate Prerequisites:
None
Permission Required:
Please contact mrlsherm@bu.edu if you would like to be enrolled in this course. If you do not meet the prereqs, you must e-mail Dr. Frydman for permission, hfrydman@bu.edu.

Class Format:
Lectures introduce basic concepts and scientific papers from specialized journals will be presented by students and discussed with the whole class. Groups of 2-4 students (depending on class size) will present the chosen paper. A week before the presentation, the presenting group should provide a glossary of the scientific terms present in the paper to the rest of the class. Every student is expected to read the paper, answer the generic questions for each paper, and participate in the discussion.

Absence
If for some reason you cannot attend class during your presentation, please inform Prof. Frydman ASAP.

Academic Conduct
This class will be taught in compliance with the Boston University Academic Conduct Code. All students are expected to adhere. The URL for the Code is: http://www.bu.edu/academics/policies/academic-conduct-code/. Graduate students should refer to the GRS Academic Conduct Code, http://www.bu.edu/cas/students/graduate/forms-policies-procedures/academic-discipline-procedures/. Cases of suspected misconduct will be referred to the Dean’s Office.

Topics and related reading
Note: reading material listed here is only suggested reading and articles that could be utilized in the discussion. Scientific articles assigned to groups for presentation are not necessarily in this list and will be provided during the course, two weeks before the presentations.

Week 1
Lecture: Introduction to the concept of Microbiome:
What it is, where it is and what are the tools to study the Microbiome.

Articles for group presentation and discussion:
The use of the term microbiome was coined by Nobel Laureate Joshua Lederberg as commented on in this article.

The NIH HMP Working Group, The NIH Human Microbiome Project
www.ncbi.nlm.nih.gov/pmc/articles/PMC2792171/

Week 2
Lecture: Sequencing Technologies
The development of novel sequencing technologies allowed the identification of a myriad of microbial life in the tissues of multicellular hosts. These technologies, known as next-generation sequencing allow the delivery of fast, inexpensive and accurate sequencing information.

Articles for group presentation and discussion:
http://www.nature.com/nrmicro/journal/v7/n4/abs/nrmicro2088.html

**Week 3**

**Lecture: Insect microbiome**

All insects harbor a characteristic microbiome that plays an essential role in their nutrition and pathogen defense. In many cases, the microbiome supplies metabolic pathways absent in the insect, and in some cases there are dedicated organs to guarantee the transmission of the microbiome to the next generation (e.g. the bacteriome in aphids).

**Articles for group presentation and discussion:**
Engel et al., 2012. "Functional diversity within the simple gut microbiota of the honey bee". [http://www.pnas.org/content/109/27/11002](http://www.pnas.org/content/109/27/11002)


**Week 4**

**Lecture: The human microbiome project**

[http://genome.cshlp.org/content/19/12/2317.full.pdf](http://genome.cshlp.org/content/19/12/2317.full.pdf)

[http://www.nature.com/nature/journal/v486/n7402/abs/nature11234.html](http://www.nature.com/nature/journal/v486/n7402/abs/nature11234.html)

**Week 5**

**Lecture: The gut microbiome**

**Articles for group presentation and discussion:**
[http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3027896/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3027896/)

[http://www.nature.com/nature/journal/v486/n7402/abs/nature11234.html](http://www.nature.com/nature/journal/v486/n7402/abs/nature11234.html)

**Week 6**

**Lecture: The skin microbiome**

**Articles for group presentation and discussion:**
http://www.sciencemag.org/content/324/5931/1190.short

**Week 7**
*Lecture: The oral microbiome*

**Articles for group presentation and discussion:**
http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0037919

http://jb.asm.org/content/192/19/5002.full

**Week 8**
*Lecture: The microbiome in health and disease:*
*The microbiome as a tool in the control of vector transmitted diseases.*
Gut commensal bacteria and reproductive parasites have been shown to affect the capacity of mosquitoes to transmit infectious diseases.

**Articles for group presentation and discussion:**

**Week 9**
*Lecture: The microbiome in health and disease:*
*Microbiome and cancer*

**Articles for group presentation and discussion:**
Arthur et al., 2012. “Intestinal Inflammation Targets Cancer-Inducing Activity of the Microbiota” Science, Vol. 338 no. 6103 pp. 120-123. DOI: 10.1126/science.1224820
https://www.sciencemag.org/content/338/6103/120.short?cited-by=yes&legid=sci;338/6103/120

**Week 10**
*Lecture: Microbiome in health and disease:*
*Obesity associated microbiome*

**Articles for group presentation and discussion:**
http://www.nature.com/nature/journal/v444/n7122/full/nature05414.html
Week 11
Lecture: The virome
The bacteria present in the microbiome are host to temperate and lytic viruses. The diversity, dynamics and transmission of these phages are poorly understood.

Articles for group presentation and discussion:
http://www.nature.com/nature/journal/v466/n7304/abs/nature09199.html
Interesting commentaries on this work can be found here:

Week 12
Lecture: Microbiome based therapies

Articles for group presentation and discussion:
Furusawa et al., 2013. “Commensal microbe-derived butyrate induces the differentiation of colonic regulatory T cells” Nature 504, 446–450 doi:10.1038/nature12721
http://www.nature.com/nature/journal/v504/n7480/full/nature12721.html
Reardon 2014. “Microbiome therapy gains market traction” Nature 509, 269–270. doi:10.1038/509269a
http://www.nature.com/news/microbiome-therapy-gains-market- traction-1.15210

Week 13
Lecture: The microbiome and host development

Articles for group presentation and discussion:

http://www.nature.com/nrmicro/journal/v11/n4/abs/nrmicro2974.html

Week 14
Lecture: The microbiome outside the host, microbial communities in the environment

http://www.biomedcentral.com/1741-7007/12/69

http://www.nature.com/nature/journal/v501/n7468_supp/full/501S18a.html
Invited lecturer:
Dr. Jennifer Talbot
Boston University

“Microbial mechanisms of biogeochemical cycling through soils”

Discussion and questions will follow Dr. Talbot’s lecture