

Cover Sheet: Request 12932

MCB 4XXX Probiotics

Info

Process	Course New Ugrad/Pro
Status	Pending at PV - University Curriculum Committee (UCC)
Submitter	Graciela Lorca glorca@ufl.edu
Created	8/13/2018 2:03:10 PM
Updated	9/27/2018 4:34:50 PM
Description of request	New course

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	CALS - Microbiology and Cell Science 514910000	Eric Triplett	We propose that FSHN teach a complimentary course in prebiotics. Having both prebiotics and probiotics courses in the CALS curriculum would be terrific.	8/21/2018
uccconsult.pdf					8/14/2018
College	Approved	CALS - College of Agricultural and Life Sciences	Joel H Brendemuhl	Edits requested by the CALS CC have been addressed.	9/27/2018
Differences between MCB4xxx and MCB6xxx.pdf					8/27/2018
Support Letter_Food Science Human Nutrition.pdf					8/27/2018
Probiotics_syllabus_4934_revised092718.pdf					9/27/2018
Probiotics_syllabus_6937_Revised092718.pdf					9/27/2018
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			9/27/2018
No document changes					
Statewide Course Numbering System					
No document changes					
Office of the Registrar					
No document changes					
Student Academic Support System					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

Course|New for request 12932

Info

Request: MCB 4XXX Probiotics
Description of request: New course
Submitter: Graciela Lorca glorca@ufl.edu
Created: 9/27/2018 11:02:19 AM
Form version: 3

Responses

Recommended Prefix

Enter the three letter code indicating placement of course within the discipline (e.g., POS, ATR, ENC). Note that for new course proposals, the State Common Numbering System (SCNS) may assign a different prefix.

Response:
MCB

Course Level

Select the one digit code preceding the course number that indicates the course level at which the course is taught (e.g., 1=freshman, 2=sophomore, etc.).

Response:
4

Number

Enter the three digit code indicating the specific content of the course based on the SCNS taxonomy and course equivalency profiles. For new course requests, this may be XXX until SCNS assigns an appropriate number.

Response:
xxx

Category of Instruction

Indicate whether the course is introductory, intermediate or advanced. Introductory courses are those that require no prerequisites and are general in nature. Intermediate courses require some prior preparation in a related area. Advanced courses require specific competencies or knowledge relevant to the topic prior to enrollment.

Response:
Joint (Ugrad/Grad)

- 1000 and 2000 level = Introductory undergraduate
- 3000 level = Intermediate undergraduate
- 4000 level = Advanced undergraduate
- 5000 level = Introductory graduate
- 6000 level = Intermediate graduate
- 7000 level = Advanced graduate

4000/5000 and 4000/6000 levels = Joint undergraduate/graduate (these must be approved by the UCC and the Graduate Council)

Lab Code

Enter the lab code to indicate whether the course is lecture only (None), lab only (L), or a combined lecture and lab (C).

Response:
None

Course Title

Enter the title of the course as it should appear in the Academic Catalog.

Response:
Probiotics

Transcript Title

Enter the title that will appear in the transcript and the schedule of courses. Note that this must be limited to 21 characters (including spaces and punctuation).

Response:
Probiotics

Degree Type

Select the type of degree program for which this course is intended.

Response:
Baccalaureate

Delivery Method(s)

Indicate all platforms through which the course is currently planned to be delivered.

Response:
Online

Co-Listing

Will this course be jointly taught to undergraduate, graduate, and/or professional students?

Response:
Yes

Co-Listing Explanation

Please detail how coursework differs for undergraduate, graduate, and/or professional students. Additionally, please upload a copy of both the undergraduate and graduate syllabus to the request in .pdf format.

Response:
For the graduate level course, the students are required to complete all the activities and tests offered in the undergraduate course (70% of the grade). In addition, the students in the graduate level course have to write a Topics review paper based on at least five peer reviewed research articles (30% of the grade).

Effective Term

Select the requested term that the course will first be offered. Selecting "Earliest" will allow the course to be active in the earliest term after SCNS approval. If a specific term and year are selected, this should reflect the department's best projection. Courses cannot be implemented retroactively, and therefore the actual effective term cannot be prior to SCNS approval, which must be obtained prior to the first day of classes for the effective term. SCNS approval typically requires 2 to 6 weeks after approval of the course at UF.

Response:
Spring

Effective Year

Select the requested year that the course will first be offered. See preceding item for further information.

Response:
2018

Rotating Topic?

Select "Yes" if the course can have rotating (varying) topics. These course titles can vary by topic in the Schedule of Courses.

Response:
No

Repeatable Credit?

Select "Yes" if the course may be repeated for credit. If the course will also have rotating topics, be sure to indicate this in the question above.

Response:
No

Amount of Credit

Select the number of credits awarded to the student upon successful completion, or select "Variable" if the course will be offered with variable credit and then indicate the minimum and maximum credits per section. Note that credit hours are regulated by Rule 6A-10.033, FAC. If you select "Variable" for the amount of credit, additional fields will appear in which to indicate the minimum and maximum number of total credits.

Response:
3

S/U Only?

Select "Yes" if all students should be graded as S/U in the course. Note that each course must be entered into the UF curriculum inventory as either letter-graded or S/U. A course may not have both options. However, letter-graded courses allow students to take the course S/U with instructor permission.

Response:
No

Contact Type

Select the best option to describe course contact type. This selection determines whether base hours or headcount hours will be used to determine the total contact hours per credit hour. Note that the headcount hour options are for courses that involve contact between the student and the professor on an individual basis.

Response:
Regularly Scheduled

- Regularly Scheduled [base hr]
- Thesis/Dissertation Supervision [1.0 headcount hr]
- Directed Individual Studies [0.5 headcount hr]
- Supervision of Student Interns [0.8 headcount hr]
- Supervision of Teaching/Research [0.5 headcount hr]
- Supervision of Cooperative Education [0.8 headcount hr]

Contact the Office of Institutional Planning and Research (352-392-0456) with questions regarding contact type.

Weekly Contact Hours

Indicate the number of hours instructors will have contact with students each week on average throughout the duration of the course.

Response:
3

Course Description

Provide a brief narrative description of the course content. This description will be published in the Academic Catalog and is limited to 50 words or fewer. See course description guidelines.

Response:
MCBxxx is an upper division course on probiotics. This course will cover the use of microorganisms to promote a health status in the host. This course will provide a conceptual background in microbiology and immunology for the use of microorganisms for the prevention or treatment of animal and human diseases.

Prerequisites

Indicate all requirements that must be satisfied prior to enrollment in the course. Prerequisites will be automatically checked for each student attempting to register for the course. The prerequisite will be published in the Academic Catalog and must be formulated so that it can be enforced in the registration system. Please note that upper division courses (i.e., intermediate or advanced level of instruction) must have proper prerequisites to target the appropriate audience for the course.

Response:
MCB3020 or MCB3023

Completing Prerequisites on UCC forms:

- Use "&" and "or" to conjoin multiple requirements; do not use commas, semicolons, etc.
- Use parentheses to specify groupings in multiple requirements.
- Specifying a course prerequisite (without specifying a grade) assumes the required passing grade is D-. In order to specify a different grade, include the grade in parentheses immediately after the course number. For example, "MAC 2311(B)" indicates that students are required to obtain a grade of B in Calculus I. MAC2311 by itself would only require a grade of D-.

- Specify all majors or minors included (if all majors in a college are acceptable the college code is sufficient).
- "Permission of department" is always an option so it should not be included in any prerequisite or co-requisite.

Example: A grade of C in HSC 3502, passing grades in HSC 3057 or HSC 4558, and major/minor in PHHP should be written as follows:

HSC 3502(C) & (HSC 3057 or HSC 4558) & (HP college or (HS or CMS or DSC or HP or RS minor))

Co-requisites

Indicate all requirements that must be taken concurrently with the course. Co-requisites are not checked by the registration system.

Response:

None

Rationale and Placement in Curriculum

Explain the rationale for offering the course and its place in the curriculum.

Response:

These new courses (first sections taught Spring 2018) were created in response to the growing interest (among students and the public) on the use of microorganisms in the prevention and/or treatment of some human and animal diseases, as well as their use to promote a healthy status. To my knowledge, these are the first comprehensive courses available on the topic of probiotics. These courses provide a conceptual background in microbiology and immunology for the use of microorganisms in the prevention or treatment of animal and human diseases. These courses are based on peer reviewed scientific literature. It is proposed as an elective.

Course Objectives

Describe the core knowledge and skills that student should derive from the course. The objectives should be both observable and measurable.

Response:

After successful completion of this course, students will be able to:

- Understand the history of probiotics
- Compare and contrast the use of lactic acid bacteria, Bifidobacterium and Propionibacterium as probiotics
- Understand the range of proposed probiotics and the challenges in ensuring their safety and efficacy
- Compare and contrast the mechanisms used by probiotic microorganisms to modulate the host immune responses in the animal and in the human host
- List the proposed uses of probiotic microorganisms for the prevention or treatment of animal and human diseases
- Compare and contrast the applications of prebiotics, probiotics and symbiotics
- Discuss current research efforts and proposed applications of probiotics for animal and human health

Course Textbook(s) and/or Other Assigned Reading

Enter the title, author(s) and publication date of textbooks and/or readings that will be assigned. Please provide specific examples to evaluate the course.

Response:

Textbook and/or assigned readings

- Textbook: no textbook is required, this course is based on peer reviewed papers either available

for free through the links provided or through the UF library (ejournals).

- Suggested readings: For each module, suggested readings will be posted as pdf documents on Canvas or as links to download them from PUBMED (see working list at the end of the document). Students are instructed to connect to UF through VPN (if outside campus) before accessing the journals (<https://connect.ufl.edu/it/wiki/pages/glvpn.aspx>).

Suggested Readings and Sources

Unit 1. Probiotics: definitions, history and classification

Module 1. Definitions and History

- Gogineni VK, Morrow LE, Gregory PJ, Malesker MA. 2013. Probiotics: History and Evolution. *J Anc Dis Prev Rem* 1:107.
- Lauzon HLL, Dimitroglou A, Merrifield DL, Ringo E, Davies SJ. 2014. Probiotics and Prebiotics: Concepts, Definitions and History. In *Aquaculture Nutrition: Gut Health, Probiotics and Prebiotics*, First Edition. Edited by Daniel Merrifield and Einar Ringø. © 2014 John Wiley & Sons, Ltd. Published 2014 by John Wiley & Sons, Ltd.
- Soccol CR, de Souza Vandenberghe, Spier MR, et al. 2010. The Potential of Probiotics, *Food Technol. Biotechnol.* 48:413-434.

Module 2. Classification and physiology: Lactic acid bacteria (LAB)

- Axelsson L. 1998. Lactic acid bacteria: Classification and Physiology. Ch. 1. In *Lactic acid bacteria, Microbiology and Functional Aspects*. Salminen S and von Wright A, Editors. Marcel Dekker, Inc. New York. Basel.
- Stiles MH, Wilhelm H, Holzapfel WH. 1997. Lactic acid bacteria of foods and their current taxonomy. *International Journal of Food Microbiology* 36:1-29.

Module 3. Classification and physiology: Bifidobacterium and Propionibacterium

- Sela DA, Price NPJ, Mills DA. 2010. Metabolism of Bifidobacteria. In *Bifidobacteria: Genomics and Molecular Aspects* (Edited by: Baltasar Mayo and Douwe van Sinderen). Caister Academic Press, U.K.
- Zarate G, 2012. Dairy Propionibacteria: Less Conventional Probiotics to Improve the Human and Animal Health. Ch 8. In "Probiotic in Animals", book edited by Everlon Cid Rigobelo. Published: October 3, 2012 under CC BY 3.0 license. © The Author(s).
- Poonam, Pophaly SD, Tomar SK, De S, Singh R. 2012. Multifaceted attributes of dairy propionibacteria: a review. *World J Microbiol Biotechnol* . 28:3081-95.

Module 4. Impact of genomics on the characterization of probiotics

- Frese SA, Benson AK, Tannock GW, Loach DM, Kim J, et al. 2011. The Evolution of Host Specialization in the Vertebrate Gut Symbiont *Lactobacillus reuteri*. *PLoS Genet* 7(2): e1001314.
- Van Pijkeren J-P, O'Toole PW. 2009. Comparative and Functional Genomics of the Genus *Lactobacillus*. In *Lactobacillus molecular biology: From genomics to probiotics*. Ed. Ljungh, A., & Wadström, T. Norfolk, UK: Caister Academic.
- Kelleher et al. 2017. Comparative and functional genomics of the *Lactococcus lactis* taxon; insights into evolution and niche adaptation. *BMC Genomics* 18:267.
- Lukjancenko O, Ussery DW, Wassenaar TM. 2012. Comparative Genomics of Bifidobacterium, Lactobacillus and Related Probiotic Genera. *Microb Ecol.* 63: 651–673.
- Lugli GA, Milani C, Turrone F, Duranti S, Mancabelli L, Mangifesta M, Ferrario C, Modesto M, Mattarelli P, Jirí K, van Sinderen D, Ventura M. 2017. Comparative genomic and phylogenomic analyses of the Bifidobacteriaceae family. *BMC Genomics* 18:568.

Unit 2. Biotechnological applications of Lactic acid bacteria

Module 5. The uses of LAB in food fermentation

- Shiby VK, Mishra HN. 2013. Fermented Milks and Milk Products as Functional Foods —A Review, *Critical Reviews in Food Science and Nutrition* 53:482-496.

- Zannini E, Waters DM, Coffey A, Arendt EK. 2016. Production, properties, and industrial food application of lactic acid bacteria-derived exopolysaccharides. *Appl Microbiol Biotechnol.* 100:1121-35.
- Leroy F, Verluyten J, De Vuyst L. 2006. Functional meat starter cultures for improved sausage fermentation. *Int J Food Microbiol.* 106:270-85.

Module 6. Antimicrobials components of LAB

- Alvarez-Sieiro P, Montalbán-López M, Mu D, Kuipers OP. 2016. Bacteriocins of lactic acid bacteria: extending the family. *Appl Microbiol Biotechnol.* 100:2939-51.

Module 7. Bacteriophages from LAB

- Mullan WMA. 2002. Morphology of bacteriophages for lactic acid bacteria. [On-line].
- Mahony J, McDonnell B, Casey E, van Sinderen D. 2016. Phage-Host Interactions of Cheese-Making Lactic Acid Bacteria. *Annu Rev Food Sci Technol* 7:267-85.
- Mahony J, Ainsworth S, Stockdale S, van Sinderen D. 2012. Phages of lactic acid bacteria: the role of genetics in understanding phage-host interactions and their co-evolutionary processes. *Virology* 434:143-50.

Module 8. Nutraceuticals and high value metabolites produced by LABs

- Sauer M, Russmayer H, Grabherr R, Peterbauer CK, Marx H. 2017. The Efficient Clade: Lactic Acid Bacteria for Industrial Chemical Production. *Trends Biotechnol.* 35:756-769.
- Bosma EF, Forster J, Nielsen AT. 2017. Lactobacilli and pediococci as versatile cell factories - Evaluation of strain properties and genetic tools. *Biotechnol Adv* 35:419-442.
- Song AA, In LLA, Lim SHE, Rahim RA. 2017. A review on *Lactococcus lactis*: from food to factory. *Microb Cell Fact* 16:55. Erratum in: *Microb Cell Fact.* 2017 16:139.
- Lee NK, Paik HD. 2017. Bioconversion Using Lactic Acid Bacteria: Ginsenosides, GABA, and Phenolic Compounds. *J Microbiol Biotechnol* 27:869-877.
- Brown L, Pingitore EV, Mozzi F, Saavedra L, Villegas JM, Hebert EM. 2017. Lactic Acid Bacteria as Cell Factories for the Generation of Bioactive Peptides. *Protein Pept Lett.* 24:146-155.

Unit 3. Interactions of probiotics with the host immune system

Module 10. Immunomodulatory properties of probiotics: bacterial surface proteins

- Hynönen U, Palva A. 2013. Lactobacillus surface layer proteins: structure, function and applications. *Appl Microbiol Biotechnol* 97:5225-43.
- Sánchez B, Bressollier P, Urdaci MC. 2008. Exported proteins in probiotic bacteria: adhesion to intestinal surfaces, host immunomodulation and molecular cross-talking with the host. *FEMS Immunol Med Microbiol* 54:1-17

Module 11. Immunomodulatory properties of probiotics: interactions with the immune system

- O'Callaghan J, O'Toole PW. 2013. Lactobacillus: host-microbe relationships. *Curr Top Microbiol Immunol.* 358:119-54.
- Lebeer S, Vanderleyden J, De Keersmaecker SC. 2008. Genes and molecules of lactobacilli supporting probiotic action. *Microbiol Mol Biol Rev.* 72:728-64.
- Hevia A, Delgado S, Sánchez B, Margolles A. 2015. Molecular Players Involved in the Interaction Between Beneficial Bacteria and the Immune System. *Front Microbiol* 6:1285.
- Lebeer S, Vanderleyden J, De Keersmaecker SC. 2010. Host interactions of probiotic bacterial surface molecules: comparison with commensals and pathogens. *Nat Rev Microbiol.* 8:171-84.

- Tsai YT, Cheng PC, Pan TM. 2012. The immunomodulatory effects of lactic acid bacteria for improving immune functions and benefits. *Appl Microbiol Biotechnol.* 96:853-62.

Module 12. Engineering LAB and Bifidobacterium for mucosal delivery of health-associated molecules

- Bosma EF, Forster J, Nielsen AT. 2017. Lactobacilli and pediococci as versatile cell factories - Evaluation of strain properties and genetic tools. *Biotechnol Adv.* 35:419-442.
- Song AA, In LLA, Lim SHE, Rahim RA. 2017. A review on *Lactococcus lactis*: from food to factory. *Microb Cell Fact.* 16:55. Erratum in: *Microb Cell Fact* 16:139.
- Bermúdez-Humarán LG, Aubry C, Motta JP, Deraison C, Steidler L, Vergnolle N, Chatel JM, Langella P. 2013. Engineering lactococci and lactobacilli for human health. *Curr Opin Microbiol* 16:278-83.

Unit 4. Probiotics safety and efficacy

Module 13. FAO/WHO Guidelines on Probiotics

- FAO/WHO. 2002. Guidelines for the evaluation of Probiotics in Food.

Module 14. Safety considerations on probiotics

- Salminen S, von Wright A, Morelli L, Marteau P, Brassart D, de Vos WM, Fondén R, Saxelin M, Collins K, Mogensen G, Birkeland SE, Mattila-Sandholm T. 1998. Demonstration of safety of probiotics -- a review. *Int J Food Microbiol* 44:93-106.
- Sanders ME, Akkermans LM, Haller D, Hammerman C, Heimbach J, Hörmannspurger G, Huys G, Levy DD, Lutgendorff F, Mack D, Phothirath P, Solano-Aguilar G, Vaughan E. 2010. Safety assessment of probiotics for human use. *Gut Microbes* 1:164-85.
- Vanderhoof JA, Young R. 2008. Probiotics in the United States. *Clin Infect Dis.* 46 Suppl 2:S67-72; discussion S144-51.

Module 15. Environmental factors influencing the efficacy of probiotic bacteria

- Marco ML, Tachon S. 2013. Environmental factors influencing the efficacy of probiotic bacteria. *Curr Opin Biotechnol.* 24:207-13.

Module 16. Efficacy of probiotics in Human Subjects

- Salminen S, Deighton MA, Benno Y, Gorbach SL. 1998. Lactic acid bacteria in health and disease. Ch 7. In *Lactic acid bacteria, Microbiology and Functional Aspects*. Salminen S and von Wright A, Editors. Marcel Dekker, Inc. New York. Basel.
- Vlasova AN, Kandasamy S, Chattha KS, Rajashekara G, Saif LJ. 2016. Comparison of probiotic lactobacilli and bifidobacteria effects, immune responses and rotavirus vaccines and infection in different host species. *Vet Immunol Immunopathol.* 172:72-84.
- McCollum DL, Martin Rodriguez J. 2012. Detection, Treatment, and Prevention of *Clostridium difficile* Infection. *Clinical Gastroenterology and Hepatology* 10: 581-592.
- Varankovich NV, Nickerson MT, Korber DR. 2015. Probiotic-based strategies for therapeutic and prophylactic use against multiple gastrointestinal diseases. *Front Microbiol* 6:685.
- NASPGHAN NUTRITION REPORT COMMITTEE. 2006. Clinical Practice Guideline Clinical Efficacy of Probiotics: Review of the Evidence With Focus on Children. *J Pediatr Gastroenterol Nutr* 43:550- 557.
- Bron PA, Kleerebezem M, Brummer RJ, Cani PD, Mercenier A, MacDonald TT, Garcia-Ródenas CL, Wells JM. 2017. Can probiotics modulate human disease by impacting intestinal barrier function? *Br J Nutr.* 117:93-107.
- Dimidi E, Christodoulides S, Fragkos KC, Scott SM, Whelan K. 2014. The effect of probiotics

on functional constipation in adults: a systematic review and meta-analysis of randomized controlled trials. *Am J Clin Nutr.* 100:1075-84.

- Kim S, Lee H, Lee S, Lee J, Ha J, Choi Y, Yoon Y, Choi KH. 2017. Invited review: Microbe-mediated aflatoxin decontamination of dairy products and feeds. *J Dairy Sci.* 100:871-880.
- Azcárate-Peril MA, Sikes M, Bruno-Bárcena JM. 2011. The intestinal microbiota, gastrointestinal environment and colorectal cancer: a putative role for probiotics in prevention of colorectal cancer? *Am J Physiol Gastrointest Liver Physiol.* 301:G401-24.
- Czaja AJ. 2016. Factoring the intestinal microbiome into the pathogenesis of autoimmune hepatitis. *World J Gastroenterol.* 22:9257-9278.
- Mu Q, Kirby J, Reilly CM and Luo XM. 2017. Leaky Gut as a Danger Signal for Autoimmune Diseases. *Front. Immunol.* 8:598.
- Esmaeili SA, Mahmoudi M, Momtazi AA, Sahebkar A, Doulabi H, Rastin M. 2017. Tolerogenic probiotics: potential immunoregulators in Systemic Lupus Erythematosus. *J Cell Physiol.* 232:1994-2007.
- Gomes AC, Bueno AA, de Souza RG, Mota JF. 2014. Gut microbiota, probiotics and diabetes. *Nutr J.* 2014 13:60.
- Marinelli L, Tenore GC, Novellino E. 2017. Probiotic species in the modulation of the anticancer immune response. *Semin Cancer Biol.* 46:182-190.

Module 17. Probiotics in Animal Production and Health

- Hossain MI, Sadekuzzaman M, Ha SD. 2017. Probiotics as potential alternative biocontrol agents in the agriculture and food industries: A review. *Food Res Int.* 100:63-73.
- Angelakis E. 2017. Weight gain by gut microbiota manipulation in productive animals. *Microb Pathog.* 106:162-170.
- Chaucheyras-Durand F, Durand H. Probiotics in animal nutrition and health. 2010. *Benef Microbes* 1:3-9.
- C De B, Meena DK, Behera BK, Das P, Das Mohapatra PK, Sharma AP. 2014. Probiotics in fish and shellfish culture: immunomodulatory and ecophysiological responses. *Fish Physiol Biochem.* 40:921-71.

Unit 5. New frontiers in probiotic's development

Module 18. Overview on the microbiome

- Workshop Slides - JCVI Blog - J. Craig Venter Institute
- Blottière HM, de Vos WM, Ehrlich, D, Doré J. 2013. Human intestinal metagenomics: state of the art and future. *Curr Opin Microbiol* 16: 232-239.
- Morgan XC, Huttenhower C. 2012. Chapter 12: Human microbiome analysis. *PLoS Comput Biol* 8:e1002808.
- Morgan XC, Huttenhower C. 2014. Meta'omic analytic techniques for studying the intestinal microbiome. *Gastroenterology* 146:1437-1448.
- Human Microbiome Project
<https://commonfund.nih.gov/hmp/initiatives>

Module 19. Manipulation of the microbiome by probiotics

- Tojo R, Suárez A, Clemente MG, de los Reyes-Gavilán CG, Margolles A, Gueimonde M, Ruas-Madiedo P. 2014. Intestinal microbiota in health and disease: role of bifidobacteria in gut homeostasis. *World J Gastroenterol* 20:15163-76.

- McFarland LV. 2014. Use of probiotics to correct dysbiosis of normal microbiota following disease or disruptive events: a systematic review. *BMJ Open* 4:e005047.
- Collado MC, Bäuerl C, Pérez-Martínez G. 2012. Defining microbiota for developing new probiotics. *Microb Ecol Health Dis.* 23.
- Walter J. 2008. Ecological role of lactobacilli in the gastrointestinal tract: implications for fundamental and biomedical research. *Appl Environ Microbiol* 74:4985-96.

Module 20. Microbiome research to identify new probiotic microorganisms

- Neef A, Sanz Y. 2013. Future for probiotic science in functional food and dietary supplement development. *Curr Opin Clin Nutr Metab Care.* 16:679-87.
- El Hage R, Hernandez-Sanabria E, Van de Wiele T. 2017. Emerging Trends in "Smart Probiotics": Functional Consideration for the Development of Novel Health and Industrial Applications. *Front Microbiol* 8:1889.
- Miquel S, Martín R, Rossi O, Bermúdez-Humarán LG, Chatel JM, Sokol H, Thomas M, Wells JM, Langella P. 2013. *Faecalibacterium prausnitzii* and human intestinal health. *Curr Opin Microbiol.* 16:255-61.
- Cani PD and de Vos WM. 2017. Next-Generation Beneficial Microbes: The Case of *Akkermansia muciniphila*. *Front. Microbiol.* 8:1765.

Module 21. Fecal transplants as probiotics

- Borody TJ, Paramsothy S., Agrawal G. 2013. Fecal Microbiota Transplantation: Indications, Methods, Evidence, and Future Directions. *Curr Gastroenterol Rep.* 15:337.

Module 22. Probiotics, prebiotics and symbiotics

- Rastall RA, Gibson GR. 2015. Recent developments in prebiotics to selectively impact beneficial microbes and promote intestinal health. *Curr Opin Biotech* 32:42-46.
- Pandey KR, Naik SR, Vakil BV. 2015. Probiotics, prebiotics and synbiotics- a review. *J Food Sci Technol* 52: 7577–7587.
- Patel R, DuPont HL. 2015. New Approaches for Bacteriotherapy: Prebiotics, New-Generation Probiotics, and Synbiotics. *Clin Infect Dis* 60:S108–S121.
- Pineiro M, Asp N-G, Reid G, Macfarlane S, Morelli L, Brunser O, Tuohy K. 2008. FAO Technical Meeting on Prebiotics. *J Clin Gastroent* 42:S156-S159.
- Markowiak P, Slizewska K. 2017. Effects of Probiotics, Prebiotics, and Synbiotics on Human Health. *Nutrients* 9:1021

Module 23. Psychobiotics: manipulation of bacteria–gut–brain signals

- Wasilewski A, Zielinska M, Storr M, Fichna J. 2015. Beneficial Effects of Probiotics, Prebiotics, Synbiotics, and Psychobiotics in Inflammatory Bowel Disease. *Inflamm Bowel Dis.* 21:1674-82.
- Liu X, Cao S, Zhang X. 2015. Modulation of Gut Microbiota-Brain Axis by Probiotics, Prebiotics, and Diet. *J Agric Food Chem.* 63:7885-95.
- Kim N, Yun M, Oh YJ, Choi HJ. 2018. Mind-altering with the gut: Modulation of the gut-brain axis with probiotics. *J Microbiol.* 56:172-182.
- Fung TC, Olson CA, Hsiao EY. 2017. Interactions between the microbiota, immune and nervous systems in health and disease. *Nature Neuroscience* 20:145–155.
- Powell N, Walker MM, Talley NJ. 2017. The mucosal immune system: master regulator of bidirectional gut–brain communications. *Nat Rev Gastroent Hepat* 14:143–159.
- Smith PA. 2015. The tantalizing links between gut microbes and the brain. *Nature News.* 14 October 2015.

Weekly Schedule of Topics

Provide a projected weekly schedule of topics. This should have sufficient detail to evaluate how the course would meet current curricular needs and the extent to which it overlaps with existing courses at UF.

Response:

Date	Unit	Module. Topic
8-Jan*	Unit 1	Probiotics: definitions, history and classification 1. Definitions and History 2. Classification and physiology: Lactic acid bacteria (LAB) 3. Classification and physiology: Bifidobacterium and Propionibacterium 4. Impact of genomics on the characterization of probiotics_Intro to genomics 4. Impact of genomics on the characterization of probiotics_LAB part 1 4. Impact of genomics on the characterization of probiotics_LAB part 2
29-Jan	Unit 2	Assignment 1 due

Biotechnological applications of Lactic acid bacteria

29-Jan*		5. The uses of LAB in food fermentation -part 1 5. The uses of LAB in food fermentation -part 2 6. Antimicrobials components of LAB 7. Bacteriophages from LAB 8. Nutraceuticals and high value metabolites produced by LABs
12-Feb		Assignment 2 due
14-Feb		Test 1
	Unit 3	

Interactions of probiotics with the host immune system

16-Feb*		9. Overview on the adaptive and innate immune response - Part 1 9. Overview on the adaptive and innate immune response - Part 2 10. Immunomodulatory properties of probiotics: bacterial surface proteins 11. Immunomodulatory properties of probiotics: interactions with the immune system 12. Engineering LAB and Bifidobacterium for mucosal delivery of health-associated molecules: Genetic tools 12. Engineering LAB and Bifidobacterium for mucosal delivery of health-associated molecules
2-Mar		Assignment 3 due
	Unit 4	Probiotics safety and efficacy
12-Mar*		13. FAO/WHO Guidelines on Probiotics 14. Safety considerations on probiotics 15. Environmental factors influencing the efficacy of probiotics 16. Efficacy of probiotics in Human Subjects: Part 1 16. Efficacy of probiotics in Human Subjects: Part 2 16. Efficacy of probiotics in Human Subjects: Part 3 16. Efficacy of probiotics in Human Subjects: Probiotics by design 17. Probiotics in Animal Production and Health
30-Mar		Assignment 4 due
2-Apr		Test 2
	Unit 5	New frontiers in the probiotic's field
4-Apr*		18. Overview on the microbiome – Part 1 18. Overview on the microbiome – Part 2 19. Manipulation of the microbiome with probiotics 20. Microbiome based new probiotic microorganisms 21. Fecal transplants as probiotics 22. Probiotics, prebiotics and symbiotic 23. Psychobiotics and the Manipulation of Bacteria–Gut–Brain Signals
20-Apr		Assignment 5 due – EXTRA CREDIT
23-Apr		Test 3

2-May

Optional Final

*Release date for the Unit on Canvas

Links and Policies

Consult the syllabus policy page for a list of required and recommended links to add to the syllabus. Please list the links and any additional policies that will be added to the course syllabus.

Please see: syllabus.ufl.edu for more information

Response:

University of Florida Policies

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- University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575,

www.counseling.ufl.edu

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- Career Connections Center, First Floor JWRU, 392-1601, <https://career.ufl.edu/>.

Academic Resources

- E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://elearning.ufl.edu/student-help-faqs/>

- Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling.

<http://www.crc.ufl.edu/>

- Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

- Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <http://teachingcenter.ufl.edu/>
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It is important to recognize that the online classroom is in fact a classroom, and certain behaviors are expected when you communicate with both your peers and your instructors. These guidelines for online behavior and interaction are known as netiquette.

<http://teach.ufl.edu/wp-content/uploads/2012/08/NetiquetteGuideforOnlineCourses.pdf>

Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

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Students are encouraged to discuss material with each other from the course, help each other understand concepts, study together, and even discuss assessment questions with each other once the quiz window is closed. However, the following is considered academic dishonesty, and I expect that no student will ever do any of the following:

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- Copy another student's quiz in this course
- Collaborate with anyone during a quiz in this course
- Discuss the questions and answers of a quiz with other students while the quiz window is still open
- Manipulate and/or distribute any materials provided in this course for any purpose (including course lecture slides).
- Use any materials provided by a previous student in the course

Software Use

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Microsoft Office 365 Software is free for UF students
<http://www.it.ufl.edu/gatorcloud/free-office-365-downloads/>
Other free software is available at:
<http://www.software.ufl.edu/>

To check for availability of the media and technical requirements, contact the UF Computing Help Desk at (352)392-HELP(4357).

University of Florida Complaints Policy and Student Complaint Process

Most problems, questions and concerns about the course will be resolved by professionally communicating with the instructor or the TAs.

The University of Florida believes strongly in the ability of students to express concerns regarding their experiences at the University. The University encourages its students who wish to file a written complaint to submit that complaint directly to the department that manages that policy.

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This said, professionalism is a two-way-street. Unprofessional behavior of students includes, among other things: lack of communication, blaming other people or external factors, lying, affecting others negatively in a group or in the class, not accepting criticism and not being proactive in solving problems or seeking help. Furthermore, faculty often have family and other obligations to tend to. Over the weekend, replies to your inquiries or questions maybe delayed. If a student is lacking professionalism repeatedly, the instructor has the rights to file formal complaint against the student through the Dean of Student office.

Grading Scheme

List the types of assessments, assignments and other activities that will be used to determine the course grade, and the percentage contribution from each. This list should have sufficient detail to evaluate the course rigor and grade integrity. Include details about the grading rubric and percentage breakdowns for determining grades.

Response:

Assessment of learning

- Assignments (250 points): Activities will be assigned by Unit. The activities include online research on diverse topics such as “co-evolution of beneficial bacteria and its hosts”, “GMO’s and probiotics”, “Market claims: is there scientific evidence?”. The activities are mandatory and count towards the final grade. They should be completed by the deadline indicated on Canvas.
- Exams (750 points): Exams will assess your knowledge of the concepts covered during the lectures. Students must sign up on ProctorU at least 72 hours in advance.

The assessment will be performed in Three Mandatory Mid-term exams. The student will be given the option to take a final cumulative exam to improve the grade obtained through the mid-term exams.

- Mid-terms (750 points): There will be three 50 minutes proctored mid-term exams (250 points each) with multiple choice questions, true/false, fill in the blanks questions and short answers questions. All exams are mandatory and will count towards the final grade. Exams will test learning and understanding of material presented in lectures, assigned readings and in assignments.
- Optional Final to replace ONE test (with the lowest grade) will be available during Finals Week. The students MUST have taken all three tests to qualify for the Optional Final. This cumulative test will include all the content included in Units 1 to 5 and will be worth 250 points.

Grading Scale (Total 1000 points)

A	900 or above
A-	860-899

B+	830-859
B	790-829
B-	750-789
C+	720-749
C	690-719
C-	660-689
D+	630-659
D	600-629
D-	570-599
E	560 or below

Instructor(s)

Enter the name of the planned instructor or instructors, or "to be determined" if instructors are not yet identified.

Response:

Instructor: Dr. Graciela L Lorca

Office: Genetics Institute, Room 307

MCB4xxx/MCB6xxx Probiotics

Similarities between MCB4xxx and MCB6xxx

These courses are taught simultaneously.

The undergraduate and graduate level share the same lectures, tests and assignments.

Differences between MCB4xxx and MCB6xxx

For the undergraduate level course (MCB4xxx) the final grade is the result of:

Total: 1000 points

Assignments: 25% (250 points)

Tests: 75% (3 exams x 250= 750 points)

For the graduate level course (MCB6xxx), the students are required to complete all the activities and tests required in the undergraduate course (70% of the grade).

In addition, the students in the graduate level course have to write a Topics review paper based on at least five peer reviewed research articles (30% of the grade).

Total: 1000 points

Assignments: 25% (250 points)

Tests: 45% (3 exams x 150= 450 points)

Topic review: 30% (300 points)

MCB4934: Probiotics (3 credits)
Spring 2018

MCB4934 is an upper division course on probiotics. This course will cover the use of microorganisms to promote a health status in the animal and human host. This course will provide a conceptual background in microbiology and immunology for the use of microorganisms for the prevention or treatment of animal and human diseases.

Student Learning Outcomes – After successful completion of this course, students will be able to:

- Understand the history of probiotics
- Compare and contrast the use of lactic acid bacteria, *Bifidobacterium* and *Propionibacterium* as probiotics
- Understand the range of proposed probiotics and the challenges in ensuring their safety and efficacy
- Compare and contrast the mechanisms used by probiotic microorganisms to modulate the host immune responses in the animal and in the human host
- List the proposed uses of probiotic microorganisms for the prevention or treatment of animal and human diseases
- Compare and contrast the applications of prebiotics, probiotics and symbiotics
- Discuss current research efforts and proposed applications of probiotics for animal and human health

Lectures: Online through Canvas

Instructor: Dr. Graciela L Lorca

Office: Genetics Institute, Room 307

WebPage: Canvas (<https://ufl.instructure.com/>). Please select MCB4934

On line help with classroom technology: <http://helpdesk.ufl.edu/>

Pre-requisite: MCB3020 or MCB3023

Communication: for questions regarding class and textbook content use the Discussion Board, for issues on Home Work Assignments, class organization check first the syllabus, the announcements and calendar on Canvas, then post your questions on the discussion board. For all other issues contact Dr. Graciela Lorca.

VIRTUAL OFFICE HOURS: will be available every week through the BLUE BUTTON tool in Canvas. To participate go to Conferences in the left of your screen and join! You will receive a weekly reminder by email.

Students in Gainesville can also come for in person office hours:
Fridays 2-3 PM at Genetics Institute, Room 307.

All students: If you cannot make it to office hours you can request an appointment. Send an e-mail with three suggested times and I will choose one for us to meet.

Contact Information: Use TEACHER in your emails through Canvas ONLY (personal emails should only be used in a case of emergency)

Dr. Graciela L Lorca:

Email (the most efficient): ONLY use Canvas e-mail (If you do not have access to the e-learning platform and need to contact me for an **emergency**, use glorca@ufl.edu)

Phone: 273 8090 (please leave a message).

Office hours: Fridays 2-3 PM at Genetics Institute, Room 307. By appointment: (only if you cannot make it to office hours) send an e-mail with three suggested times and I will choose one for us to meet.

- **Discussion Board**: A discussion board is available in Canvas. It is very useful, please post and answer your questions on class content and organization there. Postings and answers are monitored by the instructor to make sure no mistakes get propagated. There are several discussion themes. Please post your questions in the adequate section.

Material

- **Textbook**: no textbook is required, this course is based on peer reviewed papers either available for free through the links provided or through the UF library (ejournals).

- **Suggested readings**: For each module, suggested readings will be posted as pdf documents on Canvas or as links to download them from PUBMED (see working list at the end of the document). Remember to connect to UF through VPN (if outside campus) before accessing the journals (<https://connect.ufl.edu/it/wiki/pages/glvpn.aspx>).

Assessment of learning

- **Assignments (250 points)**: Activities will be assigned by Unit. The activities include online research on diverse topics such as “co-evolution of beneficial bacteria and its hosts”, “GMO’s and probiotics”, “Market claims: is there scientific evidence?”. The activities are mandatory and count towards the final grade. They should be completed by the deadline indicated on Canvas.
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- *Optional Final to replace ONE test (with the lowest grade) will be available during Finals Week.* The students **MUST** have taken all three tests to qualify for the Optional Final. This cumulative test will include all the content included in Units 1 to 5 and will be worth 250 points.

Make-Up policy: Make-up exams will **ONLY** be allowed with a **VALID** justification. If one exam is missed, it will result in a score of 0 for the test (see below for “Excused absences”).

Excused absences:

Documentation **MUST** be provided for absences caused by serious illness, accident, jury duty, or death in the immediate family. You must contact the instructor **IN ADVANCE (as soon as possible)** of the missed exam and I will arrange an alternative time for the exam.

After the exam: The grades will be available on Canvas five days after the exam, unless notified by an announcement. Test questions will be made available through Canvas. After we release the questions, the student will have **5** days to submit questions about the test or claim mistakes in grading. No claims will be considered after that time.

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

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Grades and Grade Points

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Grading: Straight scale

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Date	Unit	Module. Topic
8-Jan*	Unit 1	Probiotics: definitions, history and classification 1. Definitions and History 2. Classification and physiology: Lactic acid bacteria (LAB) 3. Classification and physiology: <i>Bifidobacterium</i> and <i>Propionibacterium</i> 4. Impact of genomics on the characterization of probiotics_Intro to genomics 4. Impact of genomics on the characterization of probiotics_LAB part 1 4. Impact of genomics on the characterization of probiotics_LAB part 2
29-Jan		Assignment 1 due
29-Jan*	Unit 2	Biotechnological applications of Lactic acid bacteria 5. The uses of LAB in food fermentation -part 1 5. The uses of LAB in food fermentation -part 2 6. Antimicrobials components of LAB 7. Bacteriophages from LAB 8. Nutraceuticals and high value metabolites produced by LABs
12-Feb		Assignment 2 due
14-Feb		Test 1
16-Feb*	Unit 3	Interactions of probiotics with the host immune system 9. Overview on the adaptive and innate immune response - Part 1 9. Overview on the adaptive and innate immune response - Part 2 10. Immunomodulatory properties of probiotics: bacterial surface proteins 11. Immunomodulatory properties of probiotics: interactions with the immune system 12. Engineering LAB and <i>Bifidobacterium</i> for mucosal delivery of health-associated molecules: Genetic tools 12. Engineering LAB and <i>Bifidobacterium</i> for mucosal delivery of health-associated molecules
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12-Mar*	Unit 4	Probiotics safety and efficacy 13. FAO/WHO Guidelines on Probiotics 14. Safety considerations on probiotics 15. Environmental factors influencing the efficacy of probiotics 16. Efficacy of probiotics in Human Subjects: Part 1

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***Release date for the Unit on Canvas**

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Suggested Readings and Sources

Unit 1. Probiotics: definitions, history and classification

Module 1. Definitions and History

- Gogineni VK, Morrow LE, Gregory PJ, Malesker MA. 2013. Probiotics: History and Evolution. J Anc Dis Prev Rem 1:107.
- Lauzon HLL, Dimitoglou A, Merrifield DL, Ringo E, Davies SJ. 2014. Probiotics and Prebiotics: Concepts, Definitions and History. In Aquaculture Nutrition: Gut Health, Probiotics and Prebiotics, First Edition. Edited by Daniel Merrifield and Einar Ringø. © 2014 John Wiley & Sons, Ltd. Published 2014 by John Wiley & Sons, Ltd.
- Soccol CR, de Souza Vandenberghe, Spier MR, et al. 2010. The Potential of Probiotics, Food Technol. Biotechnol. 48:413-434.

Module 2. Classification and physiology: Lactic acid bacteria (LAB)

- Axelsson L. 1998. Lactic acid bacteria: Classification and Physiology. Ch. 1. In Lactic acid bacteria, Microbiology and Functional Aspects. Salminen S and von Wright A, Editors. Marcel Dekker, Inc. New York. Basel.
- Stiles MH, Wilhelm H, Holzappel WH. 1997. Lactic acid bacteria of foods and their current taxonomy. International Journal of Food Microbiology 36:1-29.

Module 3. Classification and physiology: *Bifidobacterium* and *Propionibacterium*

- Sela DA, Price NPJ, Mills DA. 2010. Metabolism of Bifidobacteria. *In* Bifidobacteria: Genomics and Molecular Aspects (Edited by: Baltasar Mayo and Douwe van Sinderen). Caister Academic Press, U.K.
- Zarate G, 2012. Dairy Propionibacteria: Less Conventional Probiotics to Improve the Human and Animal Health. Ch 8. In "[Probiotic in Animals](#)", book edited by Everlon Cid Rigobelo. Published: October 3, 2012 under [CC BY 3.0 license](#). © The Author(s).
- Poonam, Pophaly SD, Tomar SK, De S, Singh R. 2012. Multifaceted attributes of dairy propionibacteria: a review. *World J Microbiol Biotechnol* . 28:3081-95.

Module 4. Impact of genomics on the characterization of probiotics

- Frese SA, Benson AK, Tannock GW, Loach DM, Kim J, et al. 2011. The Evolution of Host Specialization in the Vertebrate Gut Symbiont *Lactobacillus reuteri*. *PLoS Genet* 7(2): e1001314.
- Van Pijkeren J-P, O'Toole PW. 2009. Comparative and Functional Genomics of the Genus *Lactobacillus*. *In* *Lactobacillus molecular biology: From genomics to probiotics*. Ed. Ljungh, A., & Wadström, T. Norfolk, UK: Caister Academic.
- Kelleher et al. 2017. Comparative and functional genomics of the *Lactococcus lactis* taxon; insights into evolution and niche adaptation. *BMC Genomics* 18:267.
- Lukjancenko O, Ussery DW, Wassenaar TM. 2012. Comparative Genomics of *Bifidobacterium*, *Lactobacillus* and Related Probiotic Genera. *Microb Ecol*. 63: 651–673.
- Lugli GA, Milani C, Turrone F, Duranti S, Mancabelli L, Mangifesta M, Ferrario C, Modesto M, Mattarelli P, Jiří K, van Sinderen D, Ventura M. 2017. Comparative genomic and phylogenomic analyses of the Bifidobacteriaceae family. *BMC Genomics* 18:568.

Unit 2. Biotechnological applications of Lactic acid bacteria

Module 5. The uses of LAB in food fermentation

- Shiby VK, Mishra HN. 2013. Fermented Milks and Milk Products as Functional Foods —A Review, *Critical Reviews in Food Science and Nutrition* 53:482-496.
- Zannini E, Waters DM, Coffey A, Arendt EK. 2016. Production, properties, and industrial food application of lactic acid bacteria-derived exopolysaccharides. *Appl Microbiol Biotechnol*. 100:1121-35.
- Leroy F, Verluoyten J, De Vuyst L. 2006. Functional meat starter cultures for improved sausage fermentation. *Int J Food Microbiol*. 106:270-85.

Module 6. Antimicrobials components of LAB

- Alvarez-Sieiro P, Montalbán-López M, Mu D, Kuipers OP. 2016. Bacteriocins of lactic acid bacteria: extending the family. *Appl Microbiol Biotechnol*. 100:2939-51.

Module 7. Bacteriophages from LAB

- Mullan WMA. 2002. Morphology of bacteriophages for lactic acid bacteria. [On-line].
- Mahony J, McDonnell B, Casey E, van Sinderen D. 2016. Phage-Host Interactions of Cheese-Making Lactic Acid Bacteria. *Annu Rev Food Sci Technol* 7:267-85.
- Mahony J, Ainsworth S, Stockdale S, van Sinderen D. 2012. Phages of lactic acid bacteria: the role of genetics in understanding phage-host interactions and their co-evolutionary processes. *Virology* 434:143-50.

Module 8. Nutraceuticals and high value metabolites produced by LABs

- Sauer M, Russmayer H, Grabherr R, Peterbauer CK, Marx H. 2017. The Efficient Clade: Lactic Acid Bacteria for Industrial Chemical Production. *Trends Biotechnol*. 35:756-769.
- Bosma EF, Forster J, Nielsen AT. 2017. Lactobacilli and pediococci as versatile cell factories - Evaluation of strain properties and genetic tools. *Biotechnol Adv* 35:419-442.
- Song AA, In LLA, Lim SHE, Rahim RA. 2017. A review on *Lactococcus lactis*: from food to factory. *Microb Cell Fact* 16:55. Erratum in: *Microb Cell Fact*. 2017 16:139.
- Lee NK, Paik HD. 2017. Bioconversion Using Lactic Acid Bacteria: Ginsenosides, GABA, and Phenolic Compounds. *J Microbiol Biotechnol* 27:869-877.
- Brown L, Pingitore EV, Mozzi F, Saavedra L, Villegas JM, Hebert EM. 2017. Lactic Acid Bacteria as Cell Factories for the Generation of Bioactive Peptides. *Protein Pept Lett*. 24:146-155.

Unit 3. Interactions of probiotics with the host immune system

Module 10. Immunomodulatory properties of probiotics: bacterial surface proteins

- Hynönen U, Palva A. 2013. *Lactobacillus* surface layer proteins: structure, function and applications. *Appl Microbiol Biotechnol* 97:5225-43.
- Sánchez B, Bressollier P, Urdaci MC. 2008. Exported proteins in probiotic bacteria: adhesion to intestinal surfaces, host immunomodulation and molecular cross-talking with the host. *FEMS Immunol Med Microbiol* 54:1-17

Module 11. Immunomodulatory properties of probiotics: interactions with the immune system

- O'Callaghan J, O'Toole PW. 2013. *Lactobacillus*: host-microbe relationships. *Curr Top Microbiol Immunol.* 358:119-54.
- Lebeer S, Vanderleyden J, De Keersmaecker SC. 2008. Genes and molecules of lactobacilli supporting probiotic action. *Microbiol Mol Biol Rev.* 72:728-64.
- Hevia A, Delgado S, Sánchez B, Margolles A. 2015. Molecular Players Involved in the Interaction Between Beneficial Bacteria and the Immune System. *Front Microbiol* 6:1285.
- Lebeer S, Vanderleyden J, De Keersmaecker SC. 2010. Host interactions of probiotic bacterial surface molecules: comparison with commensals and pathogens. *Nat Rev Microbiol.* 8:171-84.
- Tsai YT, Cheng PC, Pan TM. 2012. The immunomodulatory effects of lactic acid bacteria for improving immune functions and benefits. *Appl Microbiol Biotechnol.* 96:853-62.

Module 12. Engineering LAB and *Bifidobacterium* for mucosal delivery of health-associated molecules

- Bosma EF, Forster J, Nielsen AT. 2017. Lactobacilli and pediococci as versatile cell factories - Evaluation of strain properties and genetic tools. *Biotechnol Adv.* 35:419-442.
- Song AA, In LLA, Lim SHE, Rahim RA. 2017. A review on *Lactococcus lactis*: from food to factory. *Microb Cell Fact.* 16:55. Erratum in: *Microb Cell Fact* 16:139.
- Bermúdez-Humarán LG, Aubry C, Motta JP, Deraison C, Steidler L, Vergnolle N, Chatel JM, Langella P. 2013. Engineering lactococci and lactobacilli for human health. *Curr Opin Microbiol* 16:278-83.

Unit 4. Probiotics safety and efficacy

Module 13. FAO/WHO Guidelines on Probiotics

- FAO/WHO. 2002. Guidelines for the evaluation of Probiotics in Food.

Module 14. Safety considerations on probiotics

- Salminen S, von Wright A, Morelli L, Marteau P, Brassart D, de Vos WM, Fondén R, Saxelin M, Collins K, Mogensen G, Birkeland SE, Mattila-Sandholm T. 1998. Demonstration of safety of probiotics -- a review. *Int J Food Microbiol* 44:93-106.
- Sanders ME, Akkermans LM, Haller D, Hammerman C, Heimbach J, Hörmannspurger G, Huys G, Levy DD, Lutgendorff F, Mack D, Phothirath P, Solano-Aguilar G, Vaughan E. 2010. Safety assessment of probiotics for human use. *Gut Microbes* 1:164-85.
- Vanderhoof JA, Young R. 2008. Probiotics in the United States. *Clin Infect Dis.* 46 Suppl 2:S67-72; discussion S144-51.

Module 15. Environmental factors influencing the efficacy of probiotic bacteria

- Marco ML, Tachon S. 2013. Environmental factors influencing the efficacy of probiotic bacteria. *Curr Opin Biotechnol.* 24:207-13.

Module 16. Efficacy of probiotics in Human Subjects

- Salminen S, Deighton MA, Benno Y, Gorbach SL. 1998. Lactic acid bacteria in health and disease. Ch 7. In *Lactic acid bacteria, Microbiology and Functional Aspects*. Salminen S and von Wright A, Editors. Marcel Dekker, Inc. New York. Basel.
- Vlasova AN, Kandasamy S, Chattha KS, Rajashekara G, Saif LJ. 2016. Comparison of probiotic lactobacilli and bifidobacteria effects, immune responses and rotavirus vaccines and infection in different host species. *Vet Immunol Immunopathol.* 172:72-84.
- McCollum DL, Martin Rodriguez J. 2012. Detection, Treatment, and Prevention of *Clostridium difficile* Infection. *Clinical Gastroenterology and Hepatology* 10: 581-592.
- Varankovich NV, Nickerson MT, Korber DR. 2015. Probiotic-based strategies for therapeutic and prophylactic use against multiple gastrointestinal diseases. *Front Microbiol* 6:685.
- NASPGHAN NUTRITION REPORT COMMITTEE. 2006. Clinical Practice Guideline Clinical Efficacy of Probiotics: Review of the Evidence With Focus on Children. *J Pediatr Gastroenterol Nutr* 43:550- 557.
- Bron PA, Kleerebezem M, Brummer RJ, Cani PD, Mercenier A, MacDonald TT, Garcia-Ródenas CL, Wells JM. 2017. Can probiotics modulate human disease by impacting intestinal barrier function? *Br J Nutr.* 117:93-107.
- Dimidi E, Christodoulides S, Fragkos KC, Scott SM, Whelan K. 2014. The effect of probiotics on functional constipation in adults: a systematic review and meta-analysis of randomized controlled trials. *Am J Clin Nutr.* 100:1075-84.

- Kim S, Lee H, Lee S, Lee J, Ha J, Choi Y, Yoon Y, Choi KH. 2017. Invited review: Microbe-mediated aflatoxin decontamination of dairy products and feeds. *J Dairy Sci.* 100:871-880.
- Azcárate-Peril MA, Sikes M, Bruno-Bárcena JM. 2011. The intestinal microbiota, gastrointestinal environment and colorectal cancer: a putative role for probiotics in prevention of colorectal cancer? *Am J Physiol Gastrointest Liver Physiol.* 301:G401-24.
- Czaja AJ. 2016. Factoring the intestinal microbiome into the pathogenesis of autoimmune hepatitis. *World J Gastroenterol.* 22:9257-9278.
- Mu Q, Kirby J, Reilly CM and Luo XM. 2017. Leaky Gut as a Danger Signal for Autoimmune Diseases. *Front. Immunol.* 8:598.
- Esmaeili SA, Mahmoudi M, Momtazi AA, Sahebkar A, Doulabi H, Rastin M. 2017. Tolerogenic probiotics: potential immunoregulators in Systemic Lupus Erythematosus. *J Cell Physiol.* 232:1994-2007.
- Gomes AC, Bueno AA, de Souza RG, Mota JF. 2014. Gut microbiota, probiotics and diabetes. *Nutr J.* 2014 13:60.
- Marinelli L, Tenore GC, Novellino E. 2017. Probiotic species in the modulation of the anticancer immune response. *Semin Cancer Biol.* 46:182-190.

Module 17. Probiotics in Animal Production and Health

- Hossain MI, Sadekuzzaman M, Ha SD. 2017. Probiotics as potential alternative biocontrol agents in the agriculture and food industries: A review. *Food Res Int.* 100:63-73.
- Angelakis E. 2017. Weight gain by gut microbiota manipulation in productive animals. *Microb Pathog.* 106:162-170.
- Chaucheyras-Durand F, Durand H. Probiotics in animal nutrition and health. 2010. *Benef Microbes* 1:3-9.
- C De B, Meena DK, Behera BK, Das P, Das Mohapatra PK, Sharma AP. 2014. Probiotics in fish and shellfish culture: immunomodulatory and ecophysiological responses. *Fish Physiol Biochem.* 40:921-71.

Unit 5. New frontiers in probiotic's development

Module 18. Overview on the microbiome

- Workshop Slides - JCVI Blog - J. Craig Venter Institute
- Blottière HM, de Vos WM, Ehrlich, D, Doré J. 2013. Human intestinal metagenomics: state of the art and future. *Curr Opin Microbiol* 16: 232-239.
- Morgan XC, Huttenhower C. 2012. Chapter 12: Human microbiome analysis. *PLoS Comput Biol* 8:e1002808.
- Morgan XC, Huttenhower C. 2014. Meta'omic analytic techniques for studying the intestinal microbiome. *Gastroenterology* 146:1437-1448.
- Human Microbiome Project
<https://commonfund.nih.gov/hmp/initiatives>

Module 19. Manipulation of the microbiome by probiotics

- Tojo R, Suárez A, Clemente MG, de los Reyes-Gavilán CG, Margolles A, Gueimonde M, Ruas-Madiedo P. 2014. Intestinal microbiota in health and disease: role of bifidobacteria in gut homeostasis. *World J Gastroenterol* 20:15163-76.
- McFarland LV. 2014. Use of probiotics to correct dysbiosis of normal microbiota following disease or disruptive events: a systematic review. *BMJ Open* 4:e005047.
- Collado MC, Bäuerl C, Pérez-Martínez G. 2012. Defining microbiota for developing new probiotics. *Microb Ecol Health Dis.* 23.
- Walter J. 2008. Ecological role of lactobacilli in the gastrointestinal tract: implications for fundamental and biomedical research. *Appl Environ Microbiol* 74:4985-96.

Module 20. Microbiome research to identify new probiotic microorganisms

- Neef A, Sanz Y. 2013. Future for probiotic science in functional food and dietary supplement development. *Curr Opin Clin Nutr Metab Care.* 16:679-87.
- El Hage R, Hernandez-Sanabria E, Van de Wiele T. 2017. Emerging Trends in "Smart Probiotics": Functional Consideration for the Development of Novel Health and Industrial Applications. *Front Microbiol* 8:1889.
- Miquel S, Martín R, Rossi O, Bermúdez-Humarán LG, Chatel JM, Sokol H, Thomas M, Wells JM, Langella P. 2013. *Faecalibacterium prausnitzii* and human intestinal health. *Curr Opin Microbiol.* 16:255-61.

- Cani PD and de Vos WM. 2017. Next-Generation Beneficial Microbes: The Case of *Akkermansia muciniphila*. *Front. Microbiol.* 8:1765.

Module 21. Fecal transplants as probiotics

- Borody TJ, Paramsothy S., Agrawal G. 2013. Fecal Microbiota Transplantation: Indications, Methods, Evidence, and Future Directions. *Curr Gastroenterol Rep.* 15:337.

Module 22. Probiotics, prebiotics and symbiotics

- Rastall RA, Gibson GR. 2015. Recent developments in prebiotics to selectively impact beneficial microbes and promote intestinal health. *Curr Opin Biotech* 32:42-46.
- Pandey KR, Naik SR, Vakil BV. 2015. Probiotics, prebiotics and synbiotics- a review. *J Food Sci Technol* 52: 7577–7587.
- Patel R, DuPont HL. 2015. New Approaches for Bacteriotherapy: Prebiotics, New-Generation Probiotics, and Synbiotics. *Clin Infect Dis* 60:S108–S121.
- Pineiro M, Asp N-G, Reid G, Macfarlane S, Morelli L, Brunser O, Tuohy K. 2008. FAO Technical Meeting on Prebiotics. *J Clin Gastroent* 42:S156-S159.
- Markowiak P, Slizewska K. 2017. Effects of Probiotics, Prebiotics, and Synbiotics on Human Health. *Nutrients* 9:1021

Module 23. Psychobiotics: manipulation of bacteria–gut–brain signals

- Wasilewski A, Zielińska M, Storr M, Fichna J. 2015. Beneficial Effects of Probiotics, Prebiotics, Synbiotics, and Psychobiotics in Inflammatory Bowel Disease. *Inflamm Bowel Dis.* 21:1674-82.
- Liu X, Cao S, Zhang X. 2015. Modulation of Gut Microbiota-Brain Axis by Probiotics, Prebiotics, and Diet. *J Agric Food Chem.* 63:7885-95.
- Kim N, Yun M, Oh YJ, Choi HJ. 2018. Mind-altering with the gut: Modulation of the gut-brain axis with probiotics. *J Microbiol.* 56:172-182.
- Fung TC, Olson CA, Hsiao EY. 2017. Interactions between the microbiota, immune and nervous systems in health and disease. *Nature Neuroscience* 20:145–155.
- Powell N, Walker MM, Talley NJ. 2017. The mucosal immune system: master regulator of bidirectional gut–brain communications. *Nat Rev Gastroent Hepat* 14:143–159.

- Smith PA. 2015. The tantalizing links between gut microbes and the brain. Nature News. 14 October 2015.

MCB6937: Probiotics (3 credits)
Spring 2018

MCB6937 will cover the use of microorganisms to promote a health status in the animal and human host. This course will provide a conceptual background in microbiology and immunology for the use of microorganisms for the prevention or treatment of animal and human diseases.

Student Learning Outcomes – After successful completion of this course, students will be able to:

- Understand the history of probiotics
- Compare and contrast the use of lactic acid bacteria, *Bifidobacterium* and *Propionibacterium* as probiotics
- Understand the range of proposed probiotics and the challenges in ensuring their safety and efficacy
- Compare and contrast the mechanisms used by probiotic microorganisms to modulate the host immune responses in the animal and in the human host
- List the proposed uses of probiotic microorganisms for the prevention or treatment of animal and human diseases
- Compare and contrast the applications of prebiotics, probiotics and symbiotics
- Discuss current research efforts and proposed applications of probiotics for animal and human health

Lectures: Online through Canvas

Instructor: Dr. Graciela L Lorca

Office: Genetics Institute, Room 307

WebPage: Canvas (<https://ufl.instructure.com/>). Please select MCB6937.

On line help with classroom technology: <http://helpdesk.ufl.edu/>

Pre-requisite: MCB3020 or MCB3023

Communication: for questions regarding class and textbook content use the Discussion Board, for issues on Home Work Assignments, class organization check first the syllabus, the announcements and calendar on Canvas, then post your questions on the discussion board. For all other issues contact Dr. Graciela Lorca.

VIRTUAL OFFICE HOURS: will be available every week through the BLUE BUTTON tool in Canvas. To participate go to Conferences in the left of your screen and join! You will receive a weekly reminder by email.

Students in Gainesville can also come for in person office hours:
Fridays 2-3 PM at Genetics Institute, Room 307.

All students: If you cannot make it to office hours you can request an appointment. Send an e-mail with three suggested times and I will choose one for us to meet.

Contact Information: Use TEACHER in your emails through Canvas ONLY (personal emails should only be used in a case of emergency)

Dr. Graciela L Lorca:

Email (the most efficient): ONLY use Canvas e-mail (If you do not have access to the e-learning platform and need to contact me for an **emergency**, use glorca@ufl.edu)

Phone: 273 8090 (please leave a message).

Office hours: Fridays 2-3 PM at Genetics Institute, Room 307. By appointment: (only if you cannot make it to office hours) send an e-mail with three suggested times and I will choose one for us to meet.

- **Discussion Board:** A discussion board is available in Canvas. It is very useful, please post and answer your questions on class content and organization there. Postings and answers are monitored by the instructor to make sure no mistakes get propagated. There are several discussion themes. Please post your questions in the adequate section.

Material

- **Textbook:** textbook is not required; this course is based on peer reviewed papers either available for free through the links provided or through the UF library (ejournals).

- **Suggested readings:** For each module, suggested readings will be posted as pdf documents on Canvas or as links to download them from PUBMED (see working list at the end of the document). Remember to connect to UF through VPN (if outside campus) before accessing the journals (<https://connect.ufl.edu/it/wiki/pages/glvpn.aspx>).

Assessment of learning

- **Assignments (250 points):** Activities will be assigned by Unit. The activities include online research on diverse topics such as “co-evolution of beneficial bacteria and its hosts”, “GMO’s and probiotics”, “Market claims: is there scientific evidence?”. The

activities are mandatory and count towards the final grade. They should be completed by the deadline indicated on Canvas.

- **Topic review (300 points):** The research topics will involve the search and writing of a critical review of at least 5 scientific articles (original research, no reviews will be allowed). The student will have to complete the review on one of the five topics that will be listed on Canvas. Examples are listed below:
 - Conflicts between study of probiotics as foods, dietary supplements and drugs in the US
 - Use of Omics technologies to help understand the microbiome and probiotic functionality
 - Psychobiotics: the microbiome as a key regulator of Brain and behavior
 - Improving probiotic specificity – ‘designer probiotics’
- **Exams (450 points):** Exams will assess your knowledge of the concepts covered during the lectures. Students must sign up on ProctorU at least 72h in advance. The assessment will be performed in **Three Mandatory Mid-term exams**. The student will be given the option to take a final cumulative exam to improve the grade obtained through the mid-term exams.
 - *Mid-terms (450 points):* There will be three 50 minutes proctored mid-term exams (150 points each) with multiple choice questions, true/false, fill in the blanks questions and short answers questions. **All exams are mandatory and will count towards the final grade.** Exams will test learning and understanding of material presented in lectures, assigned readings and in assignments.
 - *Optional Final to replace ONE test (with the lowest grade) will be available during Finals Week.* The students **MUST** have taken all three tests to qualify for the Optional Final. This cumulative test will include all the content included in Units 1 to 5 and will be worth 150 points.

Make-Up policy: Make-up exams will **ONLY** be allowed with a **VALID** justification. If one exam is missed, it will result in a score of 0 for the test (see below for “Excused absences”).

Excused absences:

Documentation **MUST** be provided for absences caused by serious illness, accident, jury duty, or death in the immediate family. You must contact the instructor **IN ADVANCE (as soon as possible)** of the missed exam and I will arrange an alternative time for the exam.

After the exam: The grades will be available on Canvas three days after the exam, unless notified by an announcement. Test questions will be made available through Canvas. After we release the questions, the student will have **5** days to submit questions about the test or claim mistakes in grading. No claims will be considered after that time.

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

Grades and Grade Points

For information on current UF policies for assigning grade points, see

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Grading: Straight scale

Grading Scale

A	900 or above
A-	860-899
B+	830-859
B	790-829
B-	750-789
C+	720-749
C	690-719
C-	660-689
D+	630-659
D	600-629
D-	570-599
E	560 or below

Schedule of Classes

Date	Unit	Module. Topic
8-Jan*	Unit 1	Probiotics: definitions, history and classification 1. Definitions and History 2. Classification and physiology: Lactic acid bacteria (LAB) 3. Classification and physiology: <i>Bifidobacterium</i> and <i>Propionibacterium</i> 4. Impact of genomics on the characterization of probiotics_Intro to genomics 4. Impact of genomics on the characterization of probiotics_LAB part 1 4. Impact of genomics on the characterization of probiotics_LAB part 2
29-Jan		Assignment 1 due
31-Jan*	Unit 2	Biotechnological applications of Lactic acid bacteria 5. The uses of LAB in food fermentation -part 1 5. The uses of LAB in food fermentation -part 2 6. Antimicrobials components of LAB 7. Bacteriophages from LAB

		8. Nutraceuticals and high value metabolites produced by LABs
12-Feb		Assignment 2 due
14-Feb		Test 1
16-Feb*	Unit 3	Interactions of probiotics with the host immune system 9. Overview on the adaptive and innate immune response - Part 1 9. Overview on the adaptive and innate immune response - Part 2 10. Immunomodulatory properties of probiotics: bacterial surface proteins 11. Immunomodulatory properties of probiotics: interactions with the immune system 12. Engineering LAB and <i>Bifidobacterium</i> for mucosal delivery of health-associated molecules: Genetic tools 12. Engineering LAB and <i>Bifidobacterium</i> for mucosal delivery of health-associated molecules
2-Mar		Assignment 3 due
12-Mar*	Unit 4	Probiotics safety and efficacy 13. FAO/WHO Guidelines on Probiotics 14. Safety considerations on probiotics 15. Environmental factors influencing the efficacy of probiotics 16. Efficacy of probiotics in Human Subjects: Part 1 16. Efficacy of probiotics in Human Subjects: Part 2 16. Efficacy of probiotics in Human Subjects: Part 3 16. Efficacy of probiotics in Human Subjects: Probiotics by design 17. Probiotics in Animal Production and Health
30-Mar		Assignment 4 due
2-Apr		Test 2
4-Apr*	Unit 5	New frontiers in the probiotic's field 18. Overview on the microbiome – Part 1 18. Overview on the microbiome – Part 2
8-Apr		Topic review due
		19. Manipulation of the microbiome with probiotics 20. Microbiome based new probiotic microorganisms 21. Fecal transplants as probiotics 22. Probiotics, prebiotics and symbiotic 23. Psychobiotics and the Manipulation of Bacteria–Gut–Brain Signals
20-Apr		Assignment 5 due – EXTRA CREDIT
23-Apr		Test 3
2-May		Optional Final

***Release date for the Unit on Canvas**

University of Florida Policies

Grades and Grade Points

For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Attendance and Make-Up Work

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

Services for Students with Disabilities

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation

0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu*
Counseling Services

Groups and Workshops

Outreach and Consultation

Self-Help Library

Wellness Coaching

- U Matter We Care, www.umatter.ufl.edu/
- Career Connections Center, First Floor JWRU, 392-1601, <https://career.ufl.edu/>.

Academic Resources

- E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://elearning.ufl.edu/student-help-faqs/>
- Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <http://www.crc.ufl.edu/>
- Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.
- Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <http://teachingcenter.ufl.edu/>
- Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <http://writing.ufl.edu/writing-studio/>

Course Evaluation

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.

Class demeanor

Students are expected to arrive to class on time and behave in a manner that is respectful to the instructor and to fellow students. Please avoid the use of cell phones and restrict eating to outside of the classroom. Opinions held by other students should be respected in discussion, and conversations that do not contribute to the discussion should be held at minimum, if at all.

Netiquette guide for online courses

It is important to recognize that the online classroom is in fact a classroom, and certain

behaviors are expected when you communicate with both your peers and your instructors. These guidelines for online behavior and interaction are known as netiquette.

<http://teach.ufl.edu/wp-content/uploads/2012/08/NetiquetteGuideforOnlineCourses.pdf>

Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: *"We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity."* You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."*

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

Additional comments regarding academic integrity:

Students are encouraged to discuss material with each other from the course, help each other understand concepts, study together, and even discuss assessment questions with each other once the quiz window is closed. However, the following is considered academic dishonesty, and I expect that no student will ever do any of the following:

- Have another person complete a quiz in this course
- Copy another student's quiz in this course
- Collaborate with anyone during a quiz in this course
- Discuss the questions and answers of a quiz with other students while the quiz window is still open
- Manipulate and/or distribute any materials provided in this course for any purpose (including course lecture slides).
- Use any materials provided by a previous student in the course

Software Use

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary

damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Microsoft Office 365 Software is free for UF students

<http://www.it.ufl.edu/gatorcloud/free-office-365-downloads/>

Other free software is available at:

<http://www.software.ufl.edu/>

To check for availability of the media and technical requirements, contact the UF Computing Help Desk at (352)392-HELP(4357).

University of Florida Complaints Policy and Student Complaint Process

Most problems, questions and concerns about the course will be resolved by professionally communicating with the instructor or the TAs.

The University of Florida believes strongly in the ability of students to express concerns regarding their experiences at the University. The University encourages its students who wish to file a written complaint to submit that complaint directly to the department that manages that policy.

If a problem really cannot be resolved by communicating with the instructor or the TAs you can contact

- Residential Course: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>.
- Online Course: <http://www.distance.ufl.edu/student-complaint-process>.

This said, professionalism is a two-way-street. Unprofessional behavior of students includes, among other things: lack of communication, blaming other people or external factors, lying, affecting others negatively in a group or in the class, not accepting criticism and not being proactive in solving problems or seeking help. Furthermore, faculty often have family and other obligations to tend to. Over the weekend, replies to your inquiries or questions maybe delayed.

If a student is lacking professionalism repeatedly, the instructor has the rights to file formal complaint against the student through the Dean of Student office.

Suggested Readings and Sources

Unit 1. Probiotics: definitions, history and classification

Module 1. Definitions and History

- Gogineni VK, Morrow LE, Gregory PJ, Malesker MA. 2013. Probiotics: History and Evolution. *J Anc Dis Prev Rem* 1:107.
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Unit 4. Probiotics safety and efficacy

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Unit 5. New frontiers in probiotic's development

Module 18. Overview on the microbiome

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Module 21. Fecal transplants as probiotics

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Module 22. Probiotics, prebiotics and symbiotics

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Module 23. Psychobiotics: manipulation of bacteria–gut–brain signals

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Food Science & Human Nutrition

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Undergraduate Curriculum Committee

This letter is to express my enthusiastic support for the new courses MCB4xxx and MCB6xxx called Probiotics developed by Dr. Lorca in the Department of Microbiology and Cell Sciences.

We currently do not offer a course in this specialized area in the Food Science and Human Nutrition Department. Dr. Langkamp-Henken, Dr. Archer and myself have evaluated the syllabus and we believe it will be of interest to many of our undergraduate and graduate students.

Sincerely,

A handwritten signature in black ink that reads 'Susan S. Percival'.

Susan S. Percival, PhD
Professor & Chair
Food Science & Human Nutrition
University of Florida
percival@ufl.edu

External Consultation Results (departments with potential overlap or interest in proposed course, if any)

Department	Name and Title
_____	_____
Phone Number	E-mail
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Comments	

Department	Name and Title
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