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| **Date** | **Module** | **Class** | **Learning Goals** | **Reading** | **Comments** |
| **January** |  |  |  |  |  |
| 3 | 1 | 1 | Origins and earth systems   * Introduce students to course * Review expectations * Writing practice: *What is life?* | Reading: Achenbach J. 2012. Washington Post |  |
| 5 |  |  | * File structures and basic unix commands | R Studio Clinic | Data Science Friday |
| 8 | 1 | 2 | Origins and earth systems   * Organize the characteristics of life with respect to spatial and temporal scales * Introduce students to the concept of hierarchical control (emergent properties) * Show Powers of Ten | Handout: Relationship of time and size  Prompt: “*At what scale does life exist?”* |  |
| 10 | 1 | 3 | Origins and earth systems   * Organize the characteristics of life with respect to spatial and temporal scales * Introduce students to the concept of hierarchical control (emergent properties) * Brainstorm the order of emergence in biological systems * Discuss reading from Class 1 in relation to the “Land Ethic” | Reading: Leopold A. 1949. The Land Ethic  Reading: Whitman WB *et al*. 1998. PNAS  Reading: Definition prokaryote |  |
| 12 |  |  | * Introduction to R studio and markdown | R Studio Clinic | Data Science Friday |
| 15 | 1 | 4 | Origins and earth systems   * Introduce students to evidence worksheets * Complete evidence worksheet\_01 | Worksheet: evidence worksheet\_01 |  |
| 17 | 1 | 5 | Origins and earth systems   * Introduce students to problem sets * Initiate problem set\_01 | Problem: problem set\_01 |  |
| 19 |  |  | * Continue R tutorial | R Studio Clinic | Data Science Friday |
| 22 | 1 | 6 | Origins and earth systems   * Complete and discuss problem set\_01 * Describe module learning goals and key concepts from an “eons” perspective |  | Intro to R workshop |
| 24 | 1 | 7 | * Storm the board * Discuss problem set\_01 * Initiate evidence worksheet\_02 based on “eons” discussion in grab bag groups | Reading: Kasting FJ and Siefert JL. 2003. Science.  Reading: Nisbet EG and Sleep NH. 2003. Nature.  Reading: USGS. 2007.  Worksheet: evidence worksheet\_02  Prompt: “*Describe key events in the evolution of Earth systems”* | Intro to R workshop |
| 26 |  |  | * Continue R tutorial |  | Data Science Friday  Intro to R workshop |
| 29 | 1 | 8 | Origins and earth systems   * Complete evidence worksheet\_02 |  |  |
| 31 | 1 | 9 | * Storm the board * Discuss timeline * Provide assessment prompt and discuss writing assignment\_01 | Prompt: *“Microbial life can easily live without us; we, however, cannot survive without the global catalysis and environmental transformations it provides”*  Reading: Falkowski PG *et al*. 2008. Science.  Reading: Zehnder AJB and Stumm W. 1988. Biology of anaerobic microorganisms. Chapter 1  Problem: problem set\_02 |  |
| **February** |  |  |  |  |  |
| 2 | 1 | 10 | Origins and earth systems   * Initiate problem set\_02 in “Eon” Groups * Form grab bag groups and discuss “Microbial Engines” questions |  |  |
| 5 | 1 | 11 | Origins and earth systems   * Complete problem set\_02 * Complete grab bag activity * Storm the board * Form debate groups | Reading: Shrag DP. 2012. Fund Geobiol.  Reading: Rockstrom J *et al*. 2009. Nature.  Reading: Canfield DE *et al*. 2010. Science. | Statistical Models workshop |
| 7 | 1 | 12 | Origins and earth systems   * Groups debate “Spaceship Earth” versus “Microbial Engines” worldviews | Reading: “Primer” and “Identifying Microorganisms” | Statistical Models workshop |
| 9 | 2 | 1 | Remapping the body of the world   * Discuss debate summary * Begin instructor presentation * Collect writing assignment\_01 | Handout: debate summary  Handout: Introduction to sequencing  Problem: problem set\_03 | Statistical Models workshop |
| 12 |  |  |  |  | Family Day |
| 14 | 2 | 2 | Remapping the body of the world   * Complete instructor presentation * Initiate problem set\_03 based on grab bag groups |  |  |
| 16 | 2 | 3 | Remapping the body of the world   * Complete problem set\_03 * Storm the board | Portfolio Check |  |
| 19-23 |  |  |  |  | Reading Week |
| 26 | 2 | 4 | Remapping the body of the world   * Instructor presentation * Provide assessment prompt and discuss writing assignment\_02 | Homework: “Proteorhodopsin photosystem gene expression”  Worksheet: evidence worksheet\_04  Prompt: “*Design an experimental workflow to recover glycoside hydrolase enzymes with cellulase activity from microbial communities inhabiting the hindgut of higher termites. How would you differentiate between encoded and expressed cellulase genes in these communities? Describe specific methodological biases or limitations associated with your workflow.“* |  |
| 28 | 2 | 5 | Remapping the body of the world   * Complete evidence worksheet \_04 |  |  |
| **March** |  |  |  |  |  |
| 2 | 3 | 1 | Microbial Species Concepts   * Counting candy microbes * Initiate problem set \_04 * Collect writing assignment\_02 | Homework: “Rare biosphere” and “Wrinkles in the rare biosphere” |  |
| 5 | 3 | 2 | Microbial Species Concepts   * Complete problem set \_04 | RStudio |  |
| 7 | 3 | 3 | Microbial Species Concepts   * Initiate working with amplicon sequence data project\_01 |  | Steven at JGI Prok Advisory Meeting |
| 9 | 3 | 4 | Microbial Species Concepts   * Continue amplicon sequence data project\_01 |  | Steven at JGI Prok Advisory Meeting |
| 12 | 3 | 5 | Microbial Species Concepts   * Continue amplicon sequence data project\_01 |  |  |
| 14 | 3 | 6 | Microbial Species Concepts   * Complete amplicon sequence data project\_01 |  |  |
| 16 | 3 | 7 | Microbial Species Concepts   * Initiate instructor presentation * Begin evidence worksheet\_05 | Homework: “Extensive mosaic structure revealed”  Handout evidence worksheet\_05 |  |
| 19 | 3 | 8 | Microbial Species Concepts   * Complete instructor presentation * Complete evidence worksheet\_05 | Prompt: “*Discuss the challenges involved in defining a microbial species and how HGT complicates matters, especially in the context of the evolution and phylogenetic distribution of microbial metabolic pathways. Can you comment on how HGT influences the maintenance of global biogeochemical cycles through time? Finally, do you think it is necessary to have a clear definition of a microbial species? Why or why not?”* |  |
| 21 | 4 | 1 | Distributed metabolic networks   * Instructor presentation * Initiate metagenomics project\_02 |  |  |
| 23 | 4 | 2 | Distributed metabolic networks   * Continue metagenomics project\_02 |  |  |
| 26 | 4 | 3 | Distributed metabolic networks   * Continue metagenomics project\_02 |  |  |
| 28 | 4 | 4 | Distributed metabolic networks   * Continue metagenomics project\_02 |  |  |
| 30 |  |  |  |  | Good Friday |
| **April** |  |  |  |  |  |
| 2 |  |  |  |  | Easter Monday |
| 4 | 4 | 5 | Distributed metabolic networks   * Complete metagenomics project\_02 |  |  |
| 6 | 4 | 6 | Distributed metabolic networks   * Storm the Board * Course recap and coffee discussion * Collect writing assignment\_03 |  | Last Class |
| 9-27 |  |  | * Complete and refine course portfolios |  | Finals |

**NOTE: Additional R workshops will be added in February and March. Dates to be determined. Additional workshops focused on microbiome data are also being considered as co-curricular vehicles in sync with MICB 425 content.**