Miyazaki International College

Course Syllabus

(Spring Semester 2019)

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| Course Title (Credits) | GSC 102 Introduction to Natural/Life Science (3 Credits) |
| Course Designation for TC | N/A |
| Content Lecturer | |
| Lecturer | James M. Furse |
| E-mail address | jfurse@sky.miyazaki-mic.ac.jp |
| Office/Ext | MIC 1-205 ext. 3714 |
| Office hours | Tuesday 1300 – 1430, Thursday 1300 – 1430 |
| Language Lecturer | |
| Lecturer | Jason Adachi |
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| Office/Ext | MIC 2-205 ext. 3782 |
| Office hours | Tuesday 1545 – 1715, Thursday 1545 – 1715 |

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| Course Description: | | |
| Introduces concepts, experimental techniques, and scientific methodologies for exploring a natural life system. Examines aspects of the theory of evolution, morphology and physiology of the organisms composing the natural life systems, i.e. Monera, Protista, Animalia, Plantae and Fungi.  This course will examine the development of life on Earth, features that all living creatures share, and the process of specialization in form and function that make species unique. Living creatures will be examined through features of historical processes, diversity, and function/structure.  In addition, the process of scientific inquiry will be explored in terms of observation, question formation, the development of experimental mechanisms, and results interpretation. Furthermore, concepts of explanation, description, rules, laws, inevitability, theory, and prediction will be discussed. | | |
| Course Objectives: | | |
| Upon completion of this course, successful students should:  Content Objectives:   * Be familiar with the origin and the continuity of life, * Be familiar with the basic similarities and differences in cell function and structure ranging from bacteria to Mammalians, * Be familiar with similarity and diversity as the two faces of evolution.   Language Objectives:   * Know the vocabulary, and sentence structures necessary to discuss topics related to natural science, * Know how academic science papers and reports are organized in English, * Will have learned how to write a scientific report in English.   Critical Thinking Objectives:   * Understand the value of studying the sciences, * Be able to understand and evaluate ideas from different disciplinary perspectives, * Know how to take effective notes by identifying relevant information from texts or lectures, * Know the communication methods, and logic appropriate needed for scientific (and academic) work, * Practice critical thinking about living and non-living things and their relationship to the environment, * Be able to hypothesize and test hypothesis, * Understand cause and effect, * Understand the difference between objectivity and subjectivity, * Be able to evaluate *and* document methods and data in a report, * Be able to report information objectively. | | |
| Required Materials:  Most materials will be provided in class (or online), students *may* need to bring some ‘stuff’ to some classes.  Teaching Methodology:  Course objectives will be achieved using various active learning teaching strategies, including:   |  |  | | --- | --- | | Active Learning Teaching Strategy | Class Number | | 1. Interactive lectures | Most classes | | 1. Facilitated group and class discussions | Most classes | | 1. Self-assessment and peer review | Classes 2, 10, 16, 17 | | 1. Group work | Most classes | | 1. Presenting/Reporting to peers | Classes 2, 10, 16, 17 | | 1. Reading summaries | Most classes | | | |
| Class Number | Topic | Content/Activities |
| 1 | Planetary formation | * Introduction to course * Syllabus * Review of the scientific backgrounds |
| 2 | Solar system and the earth, origin, structure, history;  Experiment 1: Produce scale model of the solar system |
| 3 | Mathematics Scientific Communication and Notation | Mathematical background: large numbers and calculations in English |
| 4 | Scientific communication and notation  Numerical comparison, Ratios |
| 5 | Substances | Chemical background: substance, heterogeneous, homogenous, solution, compound, simple body, atom, molecules; size of matter |
| 6 | Organic Compounds | Carbohydrates and lipids: kinds, structure, function, molecular models |
| 7 | Protein: types, structure, function, molecular models |
| 8 | Nucleic acids; structure, function, molecular models |
| 9 | Chemical Evolution | Origin of life 1: Definition of life, Oparin’s hypothesis, Urey and Miller’s experiment, chemical evolution, coacervates |
| 10 | Structure of scientific (academic) report  Experiment 2: coacervate formation and observation |
| 11 | Evolution of Life | Origin of life 2: processes of life formation, theories and problems |
| 12 | Historical evidences of life formation, time line of life formation and evolution |
| 13 | Classification of Life | Classification of living things: history of systematics, classification methods |
| 14 | Major groups of living things, animal systematics, plant systematics |
| 15 | Spontaneous Generation | Spontaneous generation: How did people deny the idea?, logic and history |
| 16 | Experiment 3: design experiment to investigate spontaneous generation |
| 17 | Experiment 3 (continuing): reporting, review classes |
| 18 | Mid-Semester Exam | Mid-Semester Exam |
| 19 | Cell Theory | Cell theory: history of the idea, structure and function of cells among the groups of living things |
| 20 | Organelles 1 | Cell processes (structure and function) 1: cell wall, membrane, lining, protection and gate functions, cell recognition |
| 21 | Organelles 2 | Cell processes (structure and function) 2: nucleus, ribosome, DNA, RNA, protein, enzymes |
| 22 | Fundamentals of genetics, chromosomes, chemical basics |
| 23 | Molecular processes of protein formation, homeostatic controls of metabolism by nucleic acids |
| 24 | Organelles 3 | Cell processes (structure and function) 3: endoplasmic reticulum, Golgi body, lysosome cell membrane, material transportation in the cell, recognition and signals |
| 25 | Organelles 4 | Cell processes (structure and function) 4: supporting structures of the cell |
| 26 | Organelles 5 | Cell processes (structure and function) 5: flagella |
| 27 | Organelles 6 | Cell processes (structure and function) 6: chloroplast, energy conversion processes in cells |
| 28 | Organelles 7 | Cell processes (structure and function) 7: mitochondria, aerobic and anaerobic metabolism, evidence of symbiotic theory and evolutionary meanings, review life systematics |
| 29 | Laboratory Investigation | Experiment 4: observation of cells and their organelles |
| 30 | Laboratory Investigation | Experiment 4 (continuing): reporting, review classes |
| Week 17 | Final Exam |  |
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| Course Policies | | |
| You need to attend every class, and participate in classes (sleeping is *not* participating).If you miss a class, it is your responsibility to see your lecturer(s) afterwards (and perhaps other students who attended the class), to collect any handouts, and find out how to catch up on any work that you missed.  If you anticipate being absent from a forthcoming class, you should email both of your lecturers to explain your absence at least one day in advance. You may need to turn off your phone before coming to class. | | |
| Class Preparation and Review | | |
| • Students are expected to spend an appropriate amount of time preparing for every class (an hour may be required for this) *plus* an appropriate amount of time (i.e. perhaps another hour) reviewing content and/or completing assigned tasks  • These may include: preparing for discussions and/or activities before the next class begins  • Students are also expected to spend an appropriate amount of time reviewing their own notes, maintaining a record of learned vocabulary, and highlighting questions and comments,  • Managing preparation and review is the responsibility of the individual student. If you want to pass this course, you need to do it. | | |
| Grades and Grading Standards: | | |
| * Class activities (e.g. assigned tasks, quizzes) 30% * Reports 30% * Mid semester examination 20% * Final examination 20%   Total 100%  Grades:  A: Greatly exceeds course expectations and requirements.  B: Exceeds course expectations and requirements.  C: Adequately meets course expectations and requirements.  D: Does not quite meet course expectations and requirements.  F: Widely fails to meet course expectations and requirements.  Grades will be awarded for participation in all intra-class and extra-class activities, submitted assessment items, and for providing correct answers on examinations.  **Note 1**: To pass this course students must pass the final exam (i.e. a mark of >50% on the final exam),  **Note 2**: Failure to submit any assessment item (including any of the assigned tasks) in this course will result in a Fail (F) grade for this course. | | |
| Methods of Feedback: | | |
| Marks will generally be returned to students within one week of submitting assessment items. Feedback will provided as is appropriate, and *via* appropriate method (i.e. written, verbal or other means). | | |
| Diploma Policy Objectives: | | |
| Work completed in this course helps students achieve the following Diploma Policy objectives:  1. Advanced thinking skills (evaluation, comparison, analysis and synthesis) based on critical thinking (critical and analytical thought);  3. The ability to identify and solve problems;  4. Advanced communicative proficiency in English. | | |
| Notes: | | |
| 1) If you have any difficulties with this course, please talk to your lecturers (you know James and Jason?). The majority of the course is based on group work and discussion (so called “Active Learning”). Asking questions without hesitation and sharing your ideas with others will help to make this class interesting and productive for everyone attending.  2) The class schedule, grading and policies/procedures are subject to change at the lecturer’s discretion. | | |

Assessment Criteria / Marking Rubric

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| **Critical thinking** | |
| Advanced | Student is able to apply the concepts taught in class to their own work, question their previous ideas about the sciences and nature, looks at the sciences from various perspectives, contributes insightfully to class discussions & group work. |
| Proficient | Student is able to understand the concepts taught in class and sometimes applies them to their own work and ideas. Student contributes to class discussion. |
| Developing | Student is able to understand the concepts taught in class. |
| Emerging | Student does not understand the concepts taught in class. |
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| **Content** | |
| Exemplary | Student is able to apply the concepts learned in class to make better understanding of the sciences and nature in their studies, and own life. Student demonstrates sufficient knowledge of science and nature. Actively engages in all class activities and demonstrates exemplary problem solving techniques and presentation skills |
| Good | Student is able to apply the concepts learned in class to understand the sciences and nature. Student understands the class contents and demonstrates good communication skills. Student participates in class discussion voluntarily and makes good presentations. |
| Acceptable | Student demonstrates understanding of content and is adequately prepared. |
| Unacceptable | Student does not understand the content and is inadequately prepared. |

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| **English** | |
| Exemplary | Student’s oral and written English shows signs of risk-taking and is relatively free of careless errors. |
| Good | Student’s oral and written English is relatively free of careless errors. |
| Acceptable | Student makes many errors in writing OR minimal contributions to class discussion. |
| Unacceptable | Student makes many errors in writing & minimal contributions to class discussion. |