School of Engineering
Department of Biomedical Engineering
Department of Technology Management

TCMG/ BMEG 466

Foundations of DNA and Biotechnology

Spring 2016
01/19/2016 –05/06/2016

Course Syllabus

Monday 1:30-4:00 pm Full Semester
Room: Tech 163

Instructor: Prof. Christian Bach
Ph.D., MBA, MS Biochemistry
Room: Tech Building 153
cbach@bridgeport.edu

Office Hours:
Monday: 5:00-6:00pm
Tuesday: 12:00 2:0pm
Wednesday, Thursday, Friday: 10:00 am – 12:00 pm (upon appointment)
Course Overview

This course covers the fundamental science pertaining the human genome and how the biotech industry is capitalizing on the increased availability of new genetic technologies. It covers diverse areas of science related to the information content, structure and dynamics of the human genome. Information is the central theme and its many varieties of conception. The course develops the information trail beginning with the origin of information in the universe and its progression to fold and unfold information in the human genome. The course also covers the roots of DNA research, human genomics, bioinformatics, cell fate, human genetic diseases, gene therapy and stem cell research.

Course Learning Objectives

- Gather information from different disciplines to explore biological systems
- Use of particular terms and conventions to describe processes in living organisms
- Practice communication of scientific principles and cell chemical cell functions
- Analyze and present articles and book chapters
- Use online libraries
- Write individual science report

This course investigates the nature and origin of the human genome and covers contemporary issues such as:

- What is scientific foundation of data?
- What is the informative basis of genetic and genomic data?
- What information can be extracted from the human genome?
- How can potential genotoxicity binding sites of zinc finger nucleases be identified on the human genome and how can this information be used to better design zinc finger proteins for clinical applications?
- Why 98% of the human genome does not encode genes?
- What are gene switches?
- What is the epi-genome?

Text Books and Software

Textbook (required):

Endnote software: X5 recommended; available on computers in Tech 163/164

Textbooks (optional)


Additional handouts will be provided in class and/or must be downloaded from the course website on Blackboard. The handouts must be brought to class. A three-ring loose leaf binder is suggested to hold the reference materials.
Course Requirements

1. **Class Attendance, Participation, Punctuality, Cheating and Plagiarism:**
   Timely attendance at each class session is expected. Class lectures complement, but do not duplicate textbook information. Together students and instructor will create an interactive learning environment. Students must be on-time for class. A significant portion of your learning will accrue through the constructive and respectful exchange of ideas and search for alternative solutions. You must be actively engaged in class discussions to improve your thinking and communication skills.

   It is the student's responsibility to familiarize himself or herself with and adhere to the standards set forth in the policies on cheating and plagiarism as defined in Chapters 2 and 5 of the Key to UB http://www.bridgeport.edu/pages/2623.asp or the appropriate graduate program handbook.

   Always cite your sources and references in APA style. For information about how to cite visit: http://owl.english.purdue.edu/owl/resource/560/01/

   Be certain that your travel arrangements do NOT conflict with any of your team or individual presentations.

2. **Preparation, Deadlines and Late Policy:**
   No late submissions. Don’t wait until the last minute.

3. **Homework:**
   The syllabus identifies the oral and written homework assignments. Each written assignment must be typed and only one or two pages long. Late submissions have 20% penalty per day.

   !!!Homework must be submitted for grading two days before class session (deadline: Sunday noon) by email: TCMG466spring14@gmail.com – no late submission accepted

   All students are required to submit four (4) written homework assignments on topics identified in the syllabus. Students must be prepared to present their material in class. Each homework assignment must include:

   1. **Title/Topic** - State the title of selected topic
   2. **Body Text** - Summarize the key issues and facts of the topic
   3. Formulate and answer **two (2) questions** and present in class (e.g. What information does a gene contain?)
   4. **Statement for Class** – Formulate one statement on the topic that you would like to communicate in class
   5. **Sources**: cite at least one source (book, article, web-site) in APA style
      a. **Cite book in-text**: e.g. - (Klug et al., 2009) p. xx (page number of your choosing)

   Important: Make sure your case covers all 5 points above in separate sections!

   The following list contains journals and articles you can use for citation/reference.

4. **Team Project:**

   **Science Projects**
   During the first session 8 teams (2-4 members) will be formed. Each team will be assigned one of the following topics:
   1) Evolution - Darwin
   2) Relativity
   3) Double Slit Experiment
   4) Quantum Mechanics
Each team will prepare a term project on an assigned biotech topic (20-30 pages, double space, 12 point, Times New Roman). The Team must properly use and cite in-text 10-20 academic articles from academic journals and list the references at the end of the paper in mandatory APA style. The team can use articles that have been distributed by the instructor.

All sources (pages from articles, books, web pages, etc.) used for the paper must be turned into pdf and emailed together with the project submission—make sure that you cite the sources in the text with page number of the paper and reference them at the end of the paper in APA style.

The team must email the following files two days before beginning of the last session to TCMG466spring14@gmail.com:

1. PowerPoint presentation
2. Written paper
3. Sources as pdf files (articles, web pages, etc.)
   - Cite sources properly in-text including page numbers
   - List references (articles, books, web pages, etc.) in mandatory APA style at the end of the paper

To receive a high grade, every member of the group must equally participate in the presentation, its preparation and delivery.

5. Individual Science Report / Thesis Preparation

Each student will be assigned one article for analysis and research. Based on the article’s topic, each student will prepare a written science report (14 -16 pages, double space, 12 point, Times New Roman). Deadline for submission is Session ten (10). The paper must be well written, typed and page numbered, be supported by research, contain references and be consistent with graduation from a graduate program.

You can use articles that have been distributed by the instructor. All sources (pages from articles, books, web pages, etc.) you are using for the paper must be cited in-text including page numbers and be references at the end of the paper in APA style.

The paper must contain:

1. Table of content
2. Abstract
3. Introduction
4. Description and Analysis of subject matter
5. Conclusions
6. The student must properly use and cite in the text at least 10 references in the paper
7. List of references and sources in mandatory APA-style.

Grading guidelines:

- 50% proper use of Endnote and format of references, in-text citations, clarity of figures and tables,
- 40% quality of explanation (can top management understand it)
- 10% quality of material

Poster:
• 50% poster format, quality of writing and presentation, citations, focus, importance of condensed message
• 50% reaction of audience

Foundational Science:
1. Double slit experiment/Quantum Theory (Feynman, Leighton, & Sands, 1963), (Feynman, 1969), (Young, 1802),
2. EPR-experiment/Information Theory (Uzan, 2010), (Laloë, 2001), (Stapp, 1991),
3. Relativity/Universal equation (Deltete & Guy, 1991),
4. Schrödinger Cat/Parallel Universes (Gribbin, 1995),
5. Zeno’s Paradox
6. Evolution (Stewart, 2010), (Jagers op Akkerhuis, 2010),
7. Human Genome
8. Hypercycles (Manfred Eigen, Nobel prize laureate on Evolution)
9. Telomeres
10. Runaway Universe
11. Philosophy Of Science - any Aspect

Biomedical Applications:
12. Reporter Gene Assays
13. Dual Luciferase Assay for Reporter Gene Assay Sp1
14. Epi-genome
15. Gene Switches

Contemporary Biomedical Data and Management Issues:
17. Bioinformatics - any Reasonable Issue
18. Structure Of Scientific Revolutions - Thomas Kuhn
19. DNA Structure and Analysis
20. DNA Replication and Recombination
21. Genetic Code and Transcription
22. Molecular Mechanisms of Gene Regulation
23. Promoter Functions and Examples
24. Any Other Topic of Your Interest Fitting The Course Objectives

Required by Academia, students are required to upload their papers to Turn-It-In before submission.

Each student will present the paper to the class and demonstrate in-depth knowledge of the subject matter of the assigned article during the last sessions using PowerPoint (up to 7 minutes).

Each student must email following files two days before presenting the paper to TCMG466spring14@gmail.com:

1. Written Science Report
2. Power Point poster
3. PowerPoint presentation (optional), and
4. Email pdf files of articles and other sources (web pages, etc.)
   • Cite sources properly in-text including page numbers
   • List references (articles, books, web pages, etc.) in mandatory APA style at the end of the paper

Evaluation
Exam 10 %
Class Participation, Attendance 10 %
(Homework Assignments 20 %)
(Team Project 20 %)
Individual Science Report and Presentations 40 %
100 %

Point/Grade conversion for Homework and Assignments

<table>
<thead>
<tr>
<th>Points</th>
<th>Grade</th>
<th>Points</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.00</td>
<td>A</td>
<td>3.00</td>
<td>C</td>
</tr>
<tr>
<td>4.67</td>
<td>A-</td>
<td>2.67</td>
<td>C-</td>
</tr>
<tr>
<td>4.33</td>
<td>B+</td>
<td>2.33</td>
<td>D+</td>
</tr>
<tr>
<td>4.00</td>
<td>B</td>
<td>2.00</td>
<td>D</td>
</tr>
<tr>
<td>3.67</td>
<td>B-</td>
<td>1.67</td>
<td>D-</td>
</tr>
<tr>
<td>3.33</td>
<td>C+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Course Policies

- Ethics policy - Don’t lie or cheat.
- Open book policy - If you don't open your books, you don’t participate.
- You need to buy the textbook!
- Read the syllabus.
- Read exam question before answering it.
- The syllabus is tentative. Report errors or omissions in the syllabus. – Don’t use them as excuse.
- In-class announcements are the rule – not the syllabus.

It is the student's responsibility to familiarize himself or herself with and adhere to the standards set forth in the policies on cheating and plagiarism as defined in Chapters 2 and 5 of the Key to UB http://www.bridgeport.edu/pages/2623.asp or the appropriate graduate program handbook.

Course Structure

Lecturing is only one of the three approaches used in this course. Knowledge will be acquired through facilitated case/article discussions and student presentations. Students are expected to engage actively in preparing for and presenting the case materials. For completing the assignment and project, students may need to do additional research, and look for information and knowledge that is not covered by the textbook and the lectures. It is assumed that a major learning objective for this course is to cultivate students’ capability in searching, identifying, evaluation, using, and integrating relevant knowledge that may or may not be provided in the class.

Schedule & Assignments

Note: this is a working outline, and may be revised to meet the needs of class participants.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics and Assignments</th>
<th>Reading (whole class)</th>
</tr>
</thead>
</table>
| **Session #1**  
  Jan21,14  
  Course set up: (Martin Luther King Day)  
  Biotech Sciences: Syllabus and Overview
  • Formation of 8 Teams
  • Discuss topics | **Foundations of Science and Biotechnology** |
The lectures are structured in three sections:
1. Textbook knowledge
2. Technology theory and exercises
3. Critical Thinking

Team Science Project 1
Team 1: Double Slit Experiment (Feynman et al., 1963)
Team 2: Relativity (Zukav, 1979),
Team 4: Evolution
Team 5: Zeno’s Paradox (Wolf, 1981)
Team 6: Schrödinger’s Cat (Gribbin, 1984), (Gribbin, 1995), (Zukav, 1979),
Team 7: Human Genome
Team 8: Epi-Genome

or

Team Science Project 2
Team 1: (Uskoković, 2010)
Team 2: (Heylighen, 2010)
Team 3: (Salthe, 2010)
Team 4: (Stewart, 2010)
Team 5: (Jagers op Akkerhuis, 2010)
Team 6: (Chaline, 2010)
Team 7: (Luk, 2010)
Team 8: (Lori & Blin, 2010)

Teams can choose any other article for being approved by instructor.

Individual
1 Poster: Individual Academic Report
4 Assignments
3 Homework

Individual Term Paper Assignments
1 Individual Academic Report (Term Paper) on a Marketing topic (8-10 pages, 20-30 references)

A1: Endnote
A2: Paper structure, formulate one clear argument from your article
- write section on Ch1.5 (Kerlinger & Lee, 2000)
- write 1+ sentences into Abstract
- write 1+ sentences into Introduction
- write 3+ sentences about the argument you selected
- write 1+ sentence into Conclusion (the lesson you learned/understood – if you don’t understand it, write a critic like – there is no clear knowledge about what exists before the Big Bang and beyond the speed of light … write down your reasoning that does not have to conform with anything said)
A3: Paper

Team book chapter and Individual Assignments
2 Book chapters
2 Science article

**Foundations of Science**

3s: Team1: ch1 Scientific Method (Kerlinger & Lee, 2000)
3s: Team2: ch5 Relations (Kerlinger & Lee, 2000)
3s: Team8: ch1 (Fitzgerald-Hayes & Reichsman, 2010)
3s: Team7: Double Slit Experiment (Feynman et al., 1963)
3s: Assignment1: Endnote

4s: Team3: ch1 (P. C. W. Davies & Brown, 1986)
4s: Team4: ch1 Matter Myth (Paul Davies & Gribbin, 1992)
4s: Team6: ch2 (Fitzgerald-Hayes & Reichsman, 2010)
4s: Team5: ch2 Mind of God (Paul Davies, 1992)

5s: Team1: ch3 (Fitzgerald-Hayes & Reichsman, 2010)
5s: Team2: ch2 Matter Myth (Paul Davies & Gribbin, 1992)
5s: Team8: ch1 Origin of Life (Paul Davies, 1999)
5s: Team7: ch7 Mind of God (Paul Davies, 1992)
5s: Assignment2:

6s: Team3: ch4 (Fitzgerald-Hayes & Reichsman, 2010)
6s: Team4: ch3 Matter Myth (Paul Davies & Gribbin, 1992)
6s: Team5: ch2 Origin of Life (Paul Davies, 1999)
6s: Team6: ch8 Mind of God (Paul Davies, 1992)
6s: Assignment3:

7s: Team1: The End of Science (Zukav, 1979)
7s: Team2: ch4 Matter Myth (Paul Davies & Gribbin, 1992)
7s: Team3: ch3 Origin of Life (Paul Davies, 1999)
7s: Team4: ch5 (Fitzgerald-Hayes & Reichsman, 2010)

8s: Team5: ch1 Quantum Leap (Wolf, 1981)
8s: Team6: ch5 Matter Myth (Paul Davies & Gribbin, 1992)
8s: Team7: ch6 (Fitzgerald-Hayes & Reichsman, 2010)
8s: Team8: ch4 Origin of Life (Paul Davies, 1999)

9s: Team4: ch2 Quantum Leap (Wolf, 1981)
9s: Team3: ch6 Matter Myth (Paul Davies & Gribbin, 1992)
9s: Team2: ch7 (Fitzgerald-Hayes & Reichsman, 2010)
9s: Team1: The Role of “I” (Zukav, 1979)

10s: Team8: The End of Science (Zukav, 1979)
10s: Team7: ch3-5 Quantum Leap (Wolf, 1981)
10s: Team6: ch6-8 Quantum Leap (Wolf, 1981)
10s: Team5: ch8 (Fitzgerald-Hayes & Reichsman, 2010)

11s: Team1-4: Individual Academic Report poster presentation
12s: Team5-8: Individual Academic Report poster presentation

Team Project (15-20 pages, 20-30 references)
13s: Team Project Presentations
14s: Team Project Presentations
15s: Final Exam
10s: Team1: The End of Science (Zukav, 1979)  
10s: Team2: ch3-5 Quantum Leap (Wolf, 1981)  
10s: Team3: ch6-8 Quantum Leap (Wolf, 1981)  

11s: Team4: ch4 Origin of Life (Paul Davies, 1999)  
11s: Team5: The Role of “I” (Zukav, 1979)  
11s: Team6: ch8 Mind of God (Paul Davies, 1992)  

12s: Team1-4: Individual Academic Report poster presentation  
13s: Team5-8: Individual Academic Report poster presentation  
14s: Team Project Presentations  
15s: Final Exam/ Guest Speaker  

Session #2  
Jan28,14  
What Darwin Never Knew (20min)  
Find information about Evolution at:  

Select Topic for Individual Science Report:  
- What are Telomeres?  
- What is iPS? What genes are used to create iPS?  
- What are the main principles of evolution  
- What are mutations? What are the main paradigms of evolution driven by mutations?  
- What is the paradigm of molecular biology?  
- Select any other topic related to DNA and Genomes  

The objective of this exercise is that students develop and demonstrate their capability to independently work on a topic and are able to properly communicate it throughout an organization. 

Students will continuously discuss their topic with class in Q&A sessions to obtain feedback on unclear issues and improve their presentation.  

Session #3  
Feb04,14  
DNA Structure and Analysis  
Team Book-Presentations – due Sunday midnight: (25min): Assigned Team  
Fitzgerald - Chapter1
creates and presents two or more Posters on assigned topic.

- T2:
- T8:
- T7:

3s: Team1: ch1 Scientific Method (Kerlinger & Lee, 2000)
3s: Team2: ch5 Relations (Kerlinger & Lee, 2000)
3s: Team8: ch1 (Fitzgerald-Hayes & Reichsman, 2010)
3s: Team7: Double Slit Experiment (Feynman et al., 1963)
3s: Assignment1: Endnote

**Exercise – Forming Mindsets:** Learn how to read and question scientific material (arguments, theories, etc.) – critical thinking theory:

Data is meaningless and needs to put into context. Your contexts depend on your mindsets. The more mindsets you can utilize, the higher the chance of accomplishment. There is no single right or wrong mindset and context.

**Quotes: Albert Einstein**

“If we knew what it was we were doing, it would not be called research, would it?”
“We can't solve problems by using the same kind of thinking we used when we created them.”
“If at first, the idea is not absurd, then there is no hope for it”
“Science is about the honest realization how little we know.”
“When you know how others think develop a new thinking.”
“Any reasonable idea is worthless.”

Science = We want to discover absolute Truth!
Theory = We don’t know!
Hypothesis = We don’t know!
Concept, Principle, Constructs, etc. = We don’t know!

There is no wrong or right in scientific experiments. They show absolute truth. It is our limited capability to perceive and interpret that prevents us from seeing absolute truth.

**Example:**

   - It is **not a theory about the origin of species**; it is a theory about species adaptations and complementary change to reasonable environmental changes.

2. “Darwin's theory of evolution, his account of why species adapt and change, has been called the **best idea anyone ever had**. But even Darwin admitted that his work was incomplete. **Vast questions were still unanswered.** And the biggest question was, "How?" How did evolution take place?” (What Darwin Never Knew, p.1 transcript).

3. “But today we can answer the questions that Darwin could not. We can look under the hood of evolution, and **see exactly** how this **mysterious process gives rise to such astounding diversity.** What's incredible about this timing, from a scientific perspective, is we're going to be able to understand that diversity. And that just adds to the excitement. It **doesn't demystify** it, it makes it all the more **magical.** And this is the magic and mystery of evolution: over eons of time **a single species gives rise to many.** An ancient fish evolves to become the ancestor of all four-limbed animals, even us.” (What Darwin Never Knew, p.1 transcript).
<table>
<thead>
<tr>
<th>Session #4</th>
<th>Feb 11,14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T2: ch2</strong></td>
<td></td>
</tr>
<tr>
<td><strong>T7: science</strong></td>
<td></td>
</tr>
<tr>
<td>Answer following to yourselves: Do I want to know the truth, or just listen to an exciting story?</td>
<td></td>
</tr>
<tr>
<td>Each student is prepared to comment and explain on an important issue using the textbook.</td>
<td></td>
</tr>
<tr>
<td><strong>DNA Replication and Recombination</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Team Book-Presentation – due Sunday midnight: (25min):</strong> Assigned Team creates and presents two or more Posters on assigned topic.</td>
<td></td>
</tr>
<tr>
<td>4s: Team3: ch1 (P. C. W. Davies &amp; Brown, 1986)</td>
<td></td>
</tr>
<tr>
<td>4s: Team4: ch1 Matter Myth (Paul Davies &amp; Gribbin, 1992)</td>
<td></td>
</tr>
<tr>
<td>4s: Team6: ch2 (Fitzgerald-Hayes &amp; Reichsman, 2010)</td>
<td></td>
</tr>
<tr>
<td>4s: Team5: ch2 Mind of God(Paul Davies, 1992)</td>
<td></td>
</tr>
<tr>
<td><strong>Exercise – Forming Mindsets:</strong> Learn how to read and question scientific material (arguments, theories, etc.) – critical thinking theory:</td>
<td></td>
</tr>
<tr>
<td>An equation is like tool let’s saying a hammer or threating needles. If you understand to nit with your t threating needle equations you might end up with a nice wool sweater. But an equation is not right or wrong. If you use a hammer you might not get a nice wool sweater, but protective knight’s armor.</td>
<td></td>
</tr>
<tr>
<td>Each student is prepared to comment and explain on an important issue using the textbook.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session #5</th>
<th>Feb 18,14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T3: ch3</strong></td>
<td></td>
</tr>
<tr>
<td><strong>T6: science</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Recombinant DNA Technology and Gene Cloning</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Team Book-Presentation – due Sunday midnight: (25min):</strong> Assigned Team creates and presents two or more Posters on assigned topic.</td>
<td></td>
</tr>
<tr>
<td>5s: Team1: ch3 (Fitzgerald-Hayes &amp; Reichsman, 2010)</td>
<td></td>
</tr>
<tr>
<td>5s: Team2: ch2 (Paul Davies &amp; Gribbin, 1992)</td>
<td></td>
</tr>
<tr>
<td>5s: Team8: ch1 Origin of Life (Paul Davies, 1999)</td>
<td></td>
</tr>
<tr>
<td>5s: Team7: ch7 (Paul Davies, 1992)</td>
<td></td>
</tr>
<tr>
<td>Each student is prepared to comment and explain on an important issue using the textbook.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session #6</th>
<th>Feb 25,14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T4: ch4</strong></td>
<td></td>
</tr>
<tr>
<td><strong>T5: science</strong></td>
<td></td>
</tr>
<tr>
<td><strong>The Genetic Code and Transcription</strong></td>
<td></td>
</tr>
<tr>
<td><strong>3:30-4:15 Team Book-Presentation – due Sunday midnight: (25min):</strong> Assigned Team creates and presents two or more Posters on assigned topic.</td>
<td></td>
</tr>
<tr>
<td>6s: Team3: ch4 (Fitzgerald-Hayes &amp; Reichsman, 2010)</td>
<td></td>
</tr>
<tr>
<td>6s: Team4: ch3 (Paul Davies &amp; Gribbin, 1992)</td>
<td></td>
</tr>
<tr>
<td>6s: Team5: ch2 (Paul Davies, 1999)</td>
<td></td>
</tr>
<tr>
<td>6s: Team6: ch8 (Paul Davies, 1992)</td>
<td></td>
</tr>
<tr>
<td>Each student is prepared to comment and explain on an important issue using the textbook.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session #7</th>
<th>March 04,14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T5: ch5</strong></td>
<td></td>
</tr>
<tr>
<td><strong>T4: science</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Translation and Proteins</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Team Book-Presentation – due Sunday midnight: (25min):</strong> Assigned Team creates and presents two or more Posters on assigned topic.</td>
<td></td>
</tr>
<tr>
<td>7s: Team1: The End of Science (Zukav, 1979)</td>
<td></td>
</tr>
<tr>
<td>7s: Team2: ch4 (Paul Davies &amp; Gribbin, 1992)</td>
<td></td>
</tr>
<tr>
<td>Session #8</td>
<td>March 11, 14</td>
</tr>
<tr>
<td>------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>Team Book-Presentation – due Sunday midnight: (25min):</strong> Assigned Team creates and presents two or more Posters on assigned topic.</td>
<td></td>
</tr>
<tr>
<td>8s: Team5: ch1 (Wolf, 1981)</td>
<td></td>
</tr>
<tr>
<td>8s: Team6: ch5 (Paul Davies &amp; Gribbin, 1992)</td>
<td></td>
</tr>
<tr>
<td>8s: Team7: ch6 (Fitzgerald-Hayes &amp; Reichsman, 2010)</td>
<td></td>
</tr>
<tr>
<td>8s: Team8: ch4 (Paul Davies, 1999)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session #9</th>
<th>March 25, 14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3:30-4:15 Team Book-Presentation – due Sunday midnight: (25min):</strong> Assigned Team creates and presents two or more Posters on assigned topic.</td>
<td></td>
</tr>
<tr>
<td>9s: Team4: ch2 (Wolf, 1981)</td>
<td></td>
</tr>
<tr>
<td>9s: Team3: ch6 (Paul Davies &amp; Gribbin, 1992)</td>
<td></td>
</tr>
<tr>
<td>9s: Team2: ch7 (Fitzgerald-Hayes &amp; Reichsman, 2010)</td>
<td></td>
</tr>
<tr>
<td>9s: Team1: The Role of “I” (Zukav, 1979)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session #10</th>
<th>April 01, 14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Team Book-Presentation – due Sunday midnight: (25min):</strong> Assigned Team creates and presents two or more Posters on assigned topic.</td>
<td></td>
</tr>
<tr>
<td>10s: Team8: The End of Science (Zukav, 1979)</td>
<td></td>
</tr>
<tr>
<td>10s: Team7: ch3-5 (Wolf, 1981)</td>
<td></td>
</tr>
<tr>
<td>10s: Team6: ch6-8 (Wolf, 1981)</td>
<td></td>
</tr>
<tr>
<td>10s: Team5: ch8 (Fitzgerald-Hayes &amp; Reichsman, 2010)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session #11</th>
<th>April 08, 14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Due: Individual</strong> Science Report Full Presentation</td>
<td></td>
</tr>
<tr>
<td><strong>Submit:</strong> electronic copy of PowerPoint posters</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session #12</th>
<th>April 15, 14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Due: Individual</strong> Science Report Full Presentation</td>
<td></td>
</tr>
<tr>
<td><strong>Submit:</strong> electronic copy of PowerPoint posters</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session #13</th>
<th>April 22, 14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Due: Team 1-4</strong> Science Project presentation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session #14</th>
<th>April 29, 14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Due: Team 5-8</strong> Science Project presentation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session #15</th>
<th>May 02, 14</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Final Exam</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Due: Individual Research Method Paper</strong></td>
<td></td>
</tr>
</tbody>
</table>


(Vidal, 2010), (Uzan, 2010),


References:


