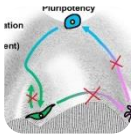


Developmental Biology



CofC's BIOL 322 lectures



Spring 2019, Richard Southgate, PhD

INSTRUCTOR CONTACT: Dr. Richard Southgate

Office: RITA 224

Phone: 953-7374 (not very efficient for many reasons, so please e-mail first)

e-mail: southgater@cofc.edu

My office visit times are: FRIDAY, 10 am to 12 noon

or brief talks before or after the Wednesday lab.

If these times are inconvenient for you, please make an appointment with me by e-mail at southgater@cofc.edu and provide me with **several** plausible times for a meeting & I will re-email you again within 24 hours in the week & up to 48 hours over the weekend with a good time for both of us.

MEETING TIMES

LECTURE: M, W, and F, 9 am to 9:50 am in RITA 152.

LABORATORY: Wednesday 2 pm to max. 5 pm in RITA 151.

Lab is **MANDATORY** as there is virtually no way to remake the lab. sections.

There will be a separate syllabus for the lab. on OAKS as well as information if you cannot come to the lab. due a genuine reason below.

COURSE DESCRIPTION

Lecture surveys the different stages of development from fertilization to organogenesis in both invertebrate and vertebrate model systems. Lecture covers both the descriptive nature of embryonic development, as well as the conserved molecular and cellular patterns. The laboratory covers some techniques of developmental biology, as well as histology slides of embryonic development, and research paper discussions. Lectures three hours per week; laboratory three hours per week. Prerequisites: BIOL 111/111L, BIOL112/112L, BIOL 211/211D, and BIOL305.

COURSE LEARNING OUTCOMES

1. Describe the steps of development and tissue formation in several major animal groups (echinoderm, nematodes, insects, and several different vertebrates).
2. Explain the concepts of cell potency, cell plasticity and determination.
3. Describe the importance of intrinsic and extrinsic cues for early developmental specification.
4. Explain and understand the concept of induction.
5. Explain the processes involved in molecular combinatorial regulation and control of gene expression as they apply to development.
6. Describe cell biology processes such as cell communication, cell migration, and cell shape as they pertain to developmental stages.
7. Demonstrate an understanding of developing hypotheses and interpreting results on the basis of their hypothesis.

COURSE OBJECTIVES

The lecture and laboratory are both integrated and complementary. The lecture and laboratory are designed to:

- Excite your imagination and love of biology.
- Develop critical reading and discussion skills using primary literature papers.
- Develop team work, as well as information gathering, critical analysis and presentation skills through research and oral presentations.

TEXT BOOK

Best: Developmental Biology, 11th Edition, Gilbert & Barresi

Hardcover: 810 pages

Publisher: Sinauer Associates Oxford University Press; May 31, 2016, Language: English
ISBN-10: 9781605354705, ISBN-13: 978-1605354705.

Hardcover	Loose Leaf	Rent
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\$127.69,	\$111.95,	\$18.98 on AMAZON or the CofC Bookstore, please check out the price differences.
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LABORATORY There is no book or manual to buy for the lab. **BUT YOU WILL NEED A NOTEBOOK!!!** All the protocols, announcements or information for each week will be posted on OAKS. Make sure to check the site frequently. If you are not familiar with OAKS, please let me know. Instruction is also available from the Library.

IMPORTANT DATES and EXAM DAYS:

<http://registrar.cofc.edu/pdf/ac-2019spring.pdf> **calendar**

<http://registrar.cofc.edu/pdf/exam-schedule-spring2019.pdf> **exam**

Spring 2019 Exam Schedule (Subject to Change)

Exam Times	Thursday April 25	Friday April 26	Saturday April 27	Sunday April 28	Monday April 29	Tuesday April 30	Wednesday May 1	Thursday May 2
8:00am- 11:00am	TR 9:25am 9:55am	MWF 11:00am 11:30am	MWF 10:00am 10:30am	Reading Day 8:00am - 4:00pm	MWF 9:00am 9:30am	TR 10:50am 11:20am	MWF 8:00am 8:30am	TR 8:00am 8:30am
12:00pm- 3:00pm	TR 12:15pm 12:45pm	MWF/MW 2:00pm 2:30pm	Math All 101, 111 Exams		MWF 12:00pm 12:30pm	TR 1:40pm 2:10pm	MWF 1:00pm 1:30pm	TR 7:05am
4:00pm- 7:00pm	TR 3:05pm 3:35pm 4:00pm	MWF 7:30am	MWF/MW 4:00pm	Online Final Exams	H	MWF 3:00pm 3:30pm MW 3:25pm	E	F
7:30pm- 10:30pm	D	I	A		B	C	J	G

Our class Final will be on April 29th 2019, at ~8:15 – 11:15 am (negotiable) in RITA 152.

TEST DATES: 50 (max. 58) MINUTES IN CLASS

- Friday 02/15/2019: First test in class,
- Monday 03/15/2019: Second test in class,
- Tuesday 04/23/2019: Third test in class.

Tue Apr 23 2019, Last day of full semester and Express II classes.

Only classes that normally meet on Monday should meet on this day, to make up for the Martin Luther King Jr. Holiday on M Jan. 21 2019.

QUIZZES: In class, using either paper quizzes or Socrative <https://www.socrative.com/>, probably on every Friday with a total of 12 quizzes, of which two will be dropped.

TESTING and GRADING:

Lectures and laboratory testing are integrated (you get only one grade, 80% in class and 20% in lab.) in this course.

- **Weekly quizzes** on lecture materials 10 pts each with the goal to have 12 quizzes and drop your 2 worst grades = **100 pts. (paper quizzes or Socrative).**
- There will be **3 tests during the semester.** These will be **multiple-choice, fill-in, mini-essay, define questions (100 pts.)** in class (see test dates above) and **3 research paper-reviews (40 points each in two parts: 30 pts. for an OAKS, DROPBOX word document and printed paper reports plus a 10 pts class discussion.**
- **Research paper #1 posted on Mon, Jan. 14 2019**
- **Class discussion** **Fri, Feb. 01 2019**
- **Report #1 due date:** **Fri, Feb. 08 2019**
- **Research paper #2 posted on Mon. Feb. 18 2019**
- **Class discussion** **Fri, Mar. 01 2019**
- **Report #2 due date:** **Fri, Mar. 08 2019**

- **Research paper #3 posted on Mon, Mar. 25 2019**
- **Class discussion Fri, Apr. 12 2019**
- **Report #3 due date: Fri, Apr. 19 2019**

GRADES:

QUIZZES: 10 X 10 PTS. = 100 pts.

3 TESTS @ 100 pts. per test = 300 pts.

3 research article review and class discussion = 40 pts. each = 120 pts.

Class participation and attendance = 20 pts.

FINAL: 160 pts, the final is cumulative.

TOTAL:

CLASS: 100 + 300 + 120 + 20 + 160 pts. = 700 pts. = 80% of the whole class plus 20% of the whole grade for the laboratory.

CLASS: 80% = 700 pts., LAB. 20% = 175 pts. so 100% for the course = 875 pts.

GRADING SCALE:

93 and above: A	74-76.9: C
90-92.9: A⁻	70-73.9: C⁻
87-89.9: B⁺	67-69.9: D⁺
83-86.9: B	64-66.9: D
80-82.9: B⁻	60-63.9 D⁻
77-79.9: C⁺	Below 60: F
This means if you have a grade of	92.8 etc. you have an A⁻

TOPICS IN BIOL-322

The below DB topics will be all studied in detail or simply reviewed in this course (mainly in class but also simple review material (BIOL-111 level) on OAKS), and all topic information will be available on OAKS 24/24. The actual order of these topics, however, may be changed (with notification in class and on OAKS).

Over the ~14 semester weeks, we will see:

- **INTRODUCTION AND DEVELOPMENTAL BIOLOGY CONCEPTS**
- **GAMETES**
- **FERTILIZATION**
- **EARLY CLEAVAGE IN MODEL SYSTEMS: SEA URCHIN, C. ELEGANS, AND XENOPUS LAEVIS**
- **CELL POLARITY AND ASYMMETRIC CELL DIVISION**
- **CELL ADHESION, SORTING AND ECM (EXTRA CELLULAR MATRIX).**
- **EARLY CELL SPECIFICATION:**
 - **INTRINSIC MATERNAL PRODUCTS,**
 - **MORPHOGENETIC GRADIENTS**

- DISCUSSION OF **SEA URCHIN, C. ELEGANS, & XENOPUS LAEVIS** AXIS ESTABLISHMENT
- OVERVIEW OF **DROSOPHILA** EARLY CLEAVAGE
- TRANSCRIPTIONAL CONTROL AND CONTROL OF COMBINATION REGULATION,
- DNA CONSTANCY CONCEPT AND CELL DIFFERENTIATION,
- CELL POTENCY AND SPECIFICATION.
- EARLY CLEAVAGE IN OTHER SYSTEMS: **DANIO RERIO, CHICKEN, AND MAMMALS** AND DISCUSSION OF THEIR AXIS ESTABLISHMENT
- GASTRULATION IN **SEA URCHIN, DROSOPHILA, AND XENOPUS LAEVIS**
- CELL CYTOSKELETON AND CELL MOVEMENT
- GERM LAYER SPECIFICATION PROCESS: INDUCTION AND ORGANIZER
- CELL COMMUNICATION
- GASTRULATION IN **DANIO RERIO (ZEBRAFISH) , CHICKEN, AND MAMMALS**
- NEURULATION: MOVEMENTS AND MOLECULAR INDUCTION
- ECTODERM DERIVATIVES INCLUDING NERVOUS SYSTEM AND NEURAL CREST CELLS
- EYE DEVELOPMENT
- MESODERM DERIVATIVES
- ENDODERM DERIVATIVES
- LIMB FORMATION
- LEFT-RIGHT SPECIFICATION
- GONADS AND SEX DETERMINATION.
- HOMEOTIC GENE

A TENTATIVE SYLLABUS OF THE SPRING '19 DEVELOPMENTAL BIOLOGY COURSE.

WEEK: Jan W 9 & F 11, 2019.

INTRODUCTION TO DEVELOPMENTAL BIOLOGY CONCEPTS.

READ CHAPTER 1 IN THE TEXTBOOK (BROWN).

CELL BIOLOGY REVIEW.

WEEK: Jan M 14, W 16, & F 18, 2019.

CELL BIOLOGY REVIEW 2, MITOSIS AND MEIOSIS REVIEW.

GAMETES

Gametes, Fertilization, Cleavage + Gastrulation notes

M Jan 14 2019: Last day of Drop/Add for full semester classes.

WEEK: Jan. W 23, & F 25, 2019

Jan. M 21 2019, Martin Luther King, Jr. Holiday, observed. No classes. College closed.

Jan: W 23 & F 25, 2019.

FERTILIZATION

WEEK: Jan M 28, W 30 & Feb. F 01, 2019

EARLY CLEAVAGE IN SEA URCHINS, C. ELEGANS AND XENOPUS LAEVIS

CELL POLARITY AND ASYMMETRIC CELL DIVISION,

CELL ADHESION, CELL SORTING, AND EXTRA CELLULAR MATRIX (ECM).

F Feb. 01 2019, Last day to submit an Application to Graduate in Spring 2019

WEEK: Feb. M 04, W 06, & F 08, 2019

EARLY CELL SPECIFICATION: LOCALIZED CYTOPLASMIC DETERMINANTS AND MORPHOGENETIC GRADIENTS IN **DROSOPHILA EARLY CLEAVAGE**

AXIS ESTABLISHMENT + TUNICATES DEVELOPMENT.

Cell specification notes.

Drosophila Notes.

WEEK: Feb. M 11, W 13, & F 15, 2019

AXIS ESTABLISHMENT 2

TRANSCRIPTIONAL CONTROL + CONTROL OF COMBINATION REGULATION,
CONTROL OF GENE EXPRESSION.

Gene expression notes

Review control of gene expression: transcription, splicing and translation,
(on OAKS)

F Feb. 15 TEST #1 COVERING DB INTRODUCTION, CELL BIOLOGY REVIEW,
MITOSIS, MEIOSIS, GAMETES, FERTILIZATION, EARLY CLEAVAGE (SU, + C.e).
CELL POLARITY AND ASYMMETRIC CELL DIVISION,
CELL ADHESION, CELL SORTING, AND EXTRA CELLULAR MATRIX (ECM).
EARLY CELL SPECIFICATION: LOCALIZED CYTOPLASMIC DETERMINANTS AND
MORPHOGENETIC GRADIENTS IN *DROSOPHILA* EARLY CLEAVAGE AXIS
ESTABLISHMENT.

WEEK: Feb. M 18, W 20, & F 22, 2019

TRANSCRIPTIONAL CONTROL + COMBINATION REGULATION,
DNA CONSTANCY CONCEPT, CELL DIFFERENTIATION,
CELL POTENCY AND SPECIFICATION.

OAKS: Review: control of gene expression: central dogma, what is a gene.

Sat. Feb. 23 2019, Designated Storm Make-Up Day (SD).

WEEK: Feb. M 25, W 27, & Mar. F 01, 2019

EARLY CLEAVAGE IN: *DANIO RERIO*, CHICKEN, AND MAMMALS
AXIS ESTABLISHMENT

GASTRULATION IN SEA URCHIN

Tue, Feb 26 2015, Full semester Mid Term and Express I final grading open to faculty

WEEK: Mar. M 04, W 06, & F 08, 2019

GASTRULATION IN SEA URCHIN 2, AND *DROSOPHILA*.

CYTOSKELETON REVIEW AND CELL MOVEMENT

GASTRULATION IN *XENOPUS LAEVIS* GERM LAYER SPECIFICATION PROCESS:
INDUCTION AND ORGANIZER, LEFT AND RIGHT SPECIFICATION.

Thur, Mar 07 2019, Full semester Mid Term and Express I final grades due at noon.

WEEK: Mar. M 11, W 13, & F 15, 2019

CELL COMMUNICATION

Cell-Cell communication notes

F, Mar 15, TEST #2 COVERING TUNICATE DEVELOPMENT,

EARLY CLEAVAGE IN *X. I.* TRANSCRIPTIONAL CONTROL + COMBINATION
REGULATION, CONTROL OF GENE EXPRESSION, DNA CONSTANCY, AND CELL
DIFFERENTIATION. CELL SPECIFICATION.

EARLY CLEAVAGE IN ZEBRAFISH, CHICKEN, + MAMMALS AXIS ESTABLISHMENT,
GASTRULATION IN SU AND *DROSOPHILA* & CYTOSKELETON CELL MOVEMENTS.

Wed. Mar 15 2019, Last day to submit an Application to Graduate in Summer 2019.

WEEK: Mar. Sun. 17 – Sun. 24, 2019, SPRING BREAK.

WEEK: Mar. M 25, W 27, & F 29, 2019

GASTRULATION IN ZEBRAFISH , CHICKEN, AND MAMMALS.

NEURULATION AND ECTODERM DERIVATIVES

EYE FORMATION

NEURAL CREST CELLS

Neurulation notes, Neural Crest Cell notes

******Mon Mar 25 2019, Last day for students to withdraw with a grade of "W" from full semester classes.** NOTE: Holds placed by the Treasurer's Office will prohibit students from being able to withdraw in Banner Self-Service. Students should settle the hold with the Treasurer to be able to withdraw online or contact the Registrar's Office by this deadline to withdraw

Tue. Mar 26 2019, WA (Failure Due to Excessive Absences) form may now be submitted by faculty for full semester classes.

WEEK: Apr. M 01, W 03, & F 05, 2019

NEURAL CREST CELLS 2,
MESODERM DERIVATIVES,
ENDODERM DERIVATIVES.

Mesoderm notes.

Endoderm notes.

WEEK: Apr. M 8, W 10, & F 12, 2019

ENDODERM DERIVATIVES 2

LIMB FORMATION

Mon Apr 08 2019, Spring 2019 Full semester and Express II Course-Instructor Evaluations open

WEEK: Apr. M 15, W 17, & F 19, 2019

LIMB FORMATION 2

*GONADS AND SEX DETERMINATION.

HOMEOTIC GENES.

WEEK: Apr. M 22 & T 23 2019 (TEST #3).

MONDAY APR 22 CLASS WILL BE OPEN, EITHER FINISHING THE PREVIOUS WEEK'S CLASS OR A REVIEW.

TUESDAY APR 23 (DUE TO MARTIN LUTHER KING JR. HOLIDAY ON JAN. 21ST 2019).

TEST #3 (AND LAST CLASS IN SPRING 2019'S BIOL-322-01.) COVERS:

GASTRULATION IN *XENOPUS LAEVIS* GERM LAYER SPECIFICATION PROCESS:

INDUCTION AND ORGANIZER, LEFT AND RIGHT SPECIFICATION.

CELL COMMUNICATION / SIGNALING

GASTRULATION IN ZEBRAFISH, CHICKEN, AND MAMMALS.

NEURULATION AND ECTODERM DERIVATIVES:

EYE FORMATION, NEURAL CREST CELLS,

MESODERM AND ECTODERM DERIVATIVE.

**REMAINING TOPIC TESTING OF THE COURSE I.E. LIMBS ETC.
WILL BE IN THE FINAL EXAM.**

Wed. Apr 24 2019, Reading Day (SD) #1.

Thur Apr 25 2019, First day of full semester and Express II final exams.

Sun Apr 28 2019 (8 – 4pm), Reading Day (SD) #2.

YOU HAVE A CHOISE OF EITHER WEDNESDAY APR 24 (READING DAY #1) OR SUNDAY APR 28 2019 READING DAY #2) FOR A 2 TO 2 1/2 HOUR REVIEW OF THE WHOLE CLASS INFORMATION . WE WILL DISCUSS THE DAY IN CLASS WITH A MAJORITY DEMOCRATIC DESCISION IN THE WEEK OF APRIL 1 → 5.

MONDAY, APR. 29TH 2019 FINAL EXAM 8 – 11AM, BUT MORE LIKELY (AGAIN BY DEMOCRATIC VOTE) AT ~8:15 AM, FINISHING AT 11:15 AM, THE NEXT FINAL IS AT 12 NOON. THE FINAL WILL BE TESTED ON EVERYTHING DISCUSSED OR STUDIED IN THE CLASSROOM AND SOME QUESTIONS FROM THE PREVIOUS WEEK'S LABORATORY FINAL CONCEPTS.

Thur May 02 2019, Last day of full semester and Express II final exams.

Thur May 02 2019, Spring 2019 Full semester and Express II Course-Instructor Evaluations close

Mon. May 06 2019, Full semester and Express II final grades due at noon. Faculty must submit a Change of Grade form after the noon deadline.

Mon. May 06 2019, Final grades for full semester and Express II classes available to students on MyCharleston by 5 p.m

Sat. May 11 2019, Spring 2019 Undergraduate Commencement (2 ceremonies) (Morning: Undergraduate School of the Arts and School of Business) (Afternoon: School of Education, Health and Human Performance, Undergraduate School of Languages, Cultures and World Affairs and Undergraduate School of Sciences and Mathematics).

Thur May 16 2019, Degrees will be posted.

COURSE POLICIES

ELECTRONIC DEVICES

You are encouraged to bring your laptop or tablet for every class, **BUT THEY CAN ONLY BE USED FOR CLASS ACTIVITIES.** Breach of that trust will lead to you losing that right.

ATTENDANCE POLICY

You are **expected** to be present for every lecture. You will be allowed **three absences for the course (~once per month) without penalty to your attendance grade AFTER THE DROP/ADD DATE: Jan. 14th 2019.** There will be regular random attendance in the class but with only 16 students, I will know who is in or not, in the class (or lab.). **EXCESSIVE ABSENCE**, i.e. **MISSING 4+ CLASSES WILL RESULT IN A "WA" GRADE (WITHDRAWN EXCESSIVE ABSENCE) AT MIDTERM AND/OR FINAL GRADE** if there is no communication with the lecturer. At midterm WA can still be changed to a regular final grade. A final "WA" grade is calculated as an "F" in

your GPA. This is a College policy. THIS POLICY OBVIOUSLY DOES NOT APPLY IF THE ABSENCES ARE DUE TO A MEDICAL OR PERSONAL REASONS WITH MEDICAL OR DOCUMENTED PROOF.

Missing classes penalizes you more than just a missed class as you also important **missed facts and you rarely able to make up the skill practice, discussion and shared ideas. Students are responsible for all content for any class missed. I make one-on-one decisions based on individual conditions and again if you have provided documentation. I will work individually with student-athletes etc. who will need to be absent for meets/competitions/games.**

COLLEGE POLICIES

- **DISABILITY SERVICES**

The College will make reasonable accommodations for persons with documented disabilities. Students should apply at the Center for Disability Services / SNAP, located on the first floor of the Lightsey Center, Suite 104. If there is a student in this class who has a documented disability and has been approved to receive accommodations through SNAP Services, please feel free to come and discuss this with me during my office hours or if necessary by an appointment.

- Any student eligible for and needing academic adjustments or accommodations because of a disability is requested to speak with the professor in a timely manner so that your needs can be addressed i.e. earlier than later.
- The College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services located on the first floor of the Lightsey Center, Suite 104. Students approved for accommodations should notify their professors as quickly as possible.
- This College abides by section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act that stipulates no student shall be denied access to an education “solely by reason of a handicap.” Disabilities covered by law include, but are not limited to, learning disabilities and hearing, sight or mobility impairments. If you have a documented disability that may have some impact on your work in this class and for which you may require accommodations, please see an administrator at the Center of Disability Services, (843) 953-1431 or me so that such accommodation may be arranged.

<http://www.disabilityservices.cofc.edu>

- **COLLEGE OF CHARLESTON HONOR CODE AND ACADEMIC INTEGRITY**

- **Lying, cheating, attempted cheating, and plagiarism** are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.
- Incidents where the instructor determines the student’s actions are related more to a misunderstanding will handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed both by the instructor and the student, will be forwarded to the Dean of Students and placed in the student’s file.
- Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the XX to be expunged. The F is permanent. The student may also be placed on disciplinary probation,

suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

- Students should be aware that unauthorized collaboration--working together without permission-- is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information via a cell phone or computer), copying from others' exams, fabricating data, and giving unauthorized assistance.
- Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor.
- Students can find the complete Honor Code and all related processes in the *Student Handbook* at
- <http://studentaffairs.cofc.edu/honor-system/>
<http://studentaffairs.cofc.edu/honor-system/studenthandbook/>
<http://parkj.people.cofc.edu/HonorCode.pdf>

- **CENTER FOR STUDENT LEARNING**

I encourage you to utilize the Center for Student Learning's (CSL) academic support services for assistance in study strategies and course content. They offer tutoring, Supplemental Instruction, study skills appointments, and workshops. Students of all abilities have become more successful using these programs throughout their academic career and the services are available to you at no additional cost. For more information regarding these services please visit the CSL website at <http://csl.cofc.edu/> or call (843)953-5635.

- **STUDY SKILLS WORKSHOPS**

Each semester a series of study skills workshops are offered free of charge to all College of Charleston students. The Workshop Series 101 is geared towards the general student population wanting more information on study skills. The Workshop Series 101 occurs three times a week lasting about 50 minutes for each session. Students will receive weekly reminders via email and Facebook for the upcoming session with time and place. You can also visit <http://csl.cofc.edu/study-skills/workshops/index.php>

As this a 300 + like course, there will be a lot of information and I will do my best to help you in this process but IF YOU ARE HAVING PROBLEMS OF UNDERSTANDING THE MATERIAL OR GETTING BEHIND IN YOUR STUDIES, SEE ME EARLY RATHER THAN LATER. I have had students who had troubles and I set up a week meeting with one or two other students to go over the info. and I raised their grades. Like always, if you feel sinking take action ASAP because the later you wait, the worse it becomes and after a certain time, it is very difficult to catch-up. Good Luck.

If you see one or more mistake in this syllabus, please let me know as my grammar checked on my CofC laptop has an "error"....