

EFB 427: Plant Developmental Biology

(Shared Resource with EFB 627)
3 credits (2 h lec and 3 h lab per week)

FALL 2010

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461 Illick Hall Office hr: T & Th 8-10:30 am or by appointment

Textbook: Howell, S.H. 1998. Molecular Genetics of Plant Development. Cambridge University Press, NY.

Course Description and Objectives:

This course is an introduction to Plant Developmental Biology. It offers a dynamic approach to the study of plant structure and development by integrating recent advances in Genetics and Molecular Biology. At the end of the course, the students should be able to describe: the internal structures of the various plant organs, how the organs are formed, the genes involved in organ formation, the mechanism behind the transition from vegetative to reproductive development, and the interplay between genes and environment. The students will also gain various skills through hands-on experience on techniques such as tissue culture, histology, web tools in bioinformatics, characterization of transgenic plants using fluorescence microscopy, and protein isolation and electrophoresis.

Course Requirements:

A. Lecture (60%)		B. Laboratory (40%)	
1. Exam 1	20%	1. Five Lab Reports	25%
2. Exam 2	20%	2. Class Participation	15%
3. Exam 3	20%		

In addition to the text, I will refer to Raven et al. (Biology of Plants, 2005) for background information and use some journal articles for current topics. A few speakers might be invited to talk on special topics. Student participation during lectures and seminars is strongly encouraged. Topics discussed in the lectures will be emphasized in the exams.

For the laboratory, we will meet regularly as scheduled, but there will be times when we will only have to do a few things, so the laboratory work will be shorter than the scheduled time. However, there will be times when you need to continue or follow-up some experiments outside of the regular laboratory period, which unfortunately cannot be avoided especially if you want to get actual experiences in as many aspects of the laboratory procedures as possible.

Read the exercises prior to each of the laboratory periods and make sure that you understand what you are doing and know the reason why you are doing it. This will not only help you to intelligently interpret and discuss your results, but also so that you can appreciate and enjoy the laboratory activities.

Course Schedule and Outline

DATE	TOPICS	READINGS
Week 1		
Aug 30	Overview of Plant Developmental Biology	1-18
Sep 01	Model Plant Systems	18-20
Lab 1A	Demonstration of Totipotency: Culture of Explants	
Lab 2A	Paraffin Method: Fixation	
Week 2		
Sep 06	Labor Day (no lec and lab)	*****
Sep 08	Elements of Genomics	Supplement
Week 3		
Sep 13	Generation of Developmental Mutants	20-23
Sep 15	Regulation of Gene Expression	Raven et al.163-179
Lab 2B	Paraffin Method: Dehydration and Infiltration	
Week 4		
Sep 20	Zygotic and Somatic Embryogenesis	55-59, 75-80
Sep 22	Genes Affecting Embryo Development	59-72
Lab 1B	Demonstration of Totipotency: Analysis of Growth & Subculture	
Lab 2C	Paraffin Method: Embedding	
Week 5		
Sep 27	Genes Affecting Embryo Development	59-72
Sep 27	Seedling Development	83-100
Sep 29	Seedling Development	83-100
Lab 3A	Introduction to Bioinformatics	454 Baker
Week 6		
Oct 04	First Lecture Exam	*****
Oct 06	Organization of Shoot Apical Meristems	103-108
Lab 1C	Demonstration of Totipotency: Analysis of Growth & Subculture	
Lab 2D	Paraffin Method: Sectioning	
Week 7		
Oct 11	Genes Affecting Activities of Shoot Meristems	108-117
Oct 13	Origin of Leaves	136-142
Lab 1D	Submission of Lab Report 1	
Lab 2E	Paraffin Method: Sectioning	

Week 8		
Oct 18	Trichome and Stomate Development	157-166
Oct 20	Transition to Flowering	169-189
Lab 2F	Paraffin Method: Staining	
Lab 3B	Submission of Lab Report 3	
Week 9		
Oct 25	ABC Model of Flower Development	192-200
Oct 27	Floral Homeotic Genes	200-210
Lab 2G	Paraffin Method: Microscopic Analysis of Sections	
Week 10		
Nov 01	Male Reproductive Development	222-228
Nov 03	Mechanism and Importance of Male Sterility	228-232
Lab 2H	Submission of Lab Report 2	
Lab 4A	Characterization of Transformed Arabidopsis	
Week 11		
Nov 08	Second Lecture Exam	*****
Nov 10	Female Reproductive Development	232-242
Lab 4B	Characterization of Transformed Arabidopsis	
Week 12		
Nov 15	Directionality of Pollen Tube Growth	244-252
Nov 17	Mate Choice in Plants	252-260
Lab 4C	Submission of Lab Report 4	
Lab 5A	Protein Gel Electrophoresis: Protein Extraction	
Week 13		
Nov 22	Seed Germination and Dormancy	263-280
Nov 24	No Lecture (Thanksgiving Break)	*****
Lab 5B	Protein Gel Electrophoresis: Running & Staining of Gel	
Week 14		
Nov 29	Genes Affecting Seed Development	263-280
Dec 01	Development of Primary and Lateral Roots	289-309
Lab 5C	Protein Gel Electrophoresis: Gel Documentation & Analysis	
Week 15		
Dec 06	Vascular Tissues (Xylem and Phloem)	312-334
Dec 08	Programmed Cell Death	312-334
Lab 5D	Submission of Lab Report 5	

Third Lecture Exam – Schedule to be announced
