

# **Junior Scientist Pipeline Training Program Course Outline**

**Monday, September 12, 2011**

## **Lecture Video 1**

- 1. Lab Overview (Dr. Leppert, Ms. Hsu, Ms. Weaver)**
  - a. Lab Safety
  - b. How to Maintain a Laboratory Journal
  - c. Laboratory Orientation
  - d. Laboratory Protocol and Instruction on the Proper Use of Laboratory Equipment: Pipette Aids and Micropipettors

**Monday, September 19, 2011**

## **Lecture Video 2**

- 2. Basic Tissue Culture (Dr. Nardone)**
  - a. Quality Control; Mycoplasma
  - b. Cross-Contamination & Misidentification

**Monday, September 26, 2011**

**Laboratory 1 – 12:00 – 5:00**

- 3. Laboratory Safety, Skills and Microscopy (Dr. Leppert, Ms. Gorham)**
  - a. Practicing Safe Science
  - b. Proper Handling and Operation of Lab Equipment
  - c. Basic Microscopy
  - d. Buffer Preparation (dry lab)

**Monday, October 3, 2011**

## **Lecture Video 3**

- 4. Biotechnology and Cell Culture Formats (Dr. Nardone)**

**Monday, October 17, 2011**

**Laboratory 2– 12:00 – 5:00**

- 5. Mammalian Tissue Culture (Ms. Gorham, Mr. Baker)**
  - a. Basic Cell and Tissue Culture: culturing and maintaining mammalian cell lines; cell counting

**Monday, October 24, 2011**

**Lecture Video 4**

- 6. Introduction to Nucleic Acids and Molecular Cloning (Dr. Castora)**

**Monday, October 31, 2011**

**Lecture Video 5**

- 7. Isolation and Characterization of DNA (Dr. Leppert)**

**Lecture Video 6**

- 8. Isolation and Characterization of RNA (Dr. Leppert)**

**Monday, November 7, 2011**

**Lecture Video 7**

- 9. The Enzymology of Molecular Biology: Restriction Endonucleases and other Pertinent Enzymes (Dr. Castora)**

**Monday, November 14, 2011**

**Laboratory 3– 12:00 – 5:00**

- 10. Nucleic Acid Isolation (Dr. Leppert)**
- a. Isolation of Mammalian Genomic DNA
  - b. Isolation of Bacterial Plasmid DNA
  - c. Isolation of Total Mammalian RNA

**Monday, November 21, 2011**

**Lecture Video 8**

- 11. The Generation of Recombinant Molecules: Cloning and Library Construction (Dr. Zarlenga)**
- a. Construction of Genomic DNA Libraries
  - b. cDNA Synthesis
  - c. Construction of cDNA Libraries

**Monday, November 28, 2011**

**Laboratory 4 – 12:00 – 5:00**

- 12. Restriction Digestion/Agarose Gel Electrophoresis (Dr. Leppert)**
- a. Restriction Digestion of Plasmid DNA
  - b. Restriction Digestion of Mammalian Genomic DNA
  - c. Agarose Gel Electrophoresis

**Monday, December 5, 2011**  
**Laboratory 5 – 12:00 – 5:00**

- 13. Cloning and Bacterial Transformation (Dr. Leppert)**
- a. Digestion and Purification of Insert DNA
  - b. Cloning Insert DNA into Plasmid Vector
  - c. Bacterial Transformation

**Monday, December 12, 2011**  
**Lecture Video 9 & 10**

- 14. Filter Hybridization Techniques (Dr. Leppert)**
- a. Blotting of Nucleic Acids; Nucleic Acid Labeling;
  - b. Hybridization and Detection Methodologies

**Tuesday, December 13, 2011**  
**Lecture Video 11**

- 15. Gene-Specific and Global Gene Expression Analyses (Dr. Greene)**
- a. Microarrays
  - b. Micro RNAs

**Monday, December 19, 2011**  
**Laboratory 6 – 12:00 – 5:00**

- 16. Electrophoresis & Probe Labeling (Dr. Leppert)**
- a. Agarose Gel Electrophoresis of Digested DNA from Laboratory 3
  - b. DNA Transfer using Southern Method
  - c. Probe Labeling

**Tuesday, December 20, 2011**  
**Laboratory 7 – 12:00 – 5:00**

- 17. Filter Hybridization and Chemiluminescent Techniques (Dr. Leppert)**
- a. Filter Prehybridization
  - b. Filter Hybridization
  - c. Chemiluminescent Detection

**Monday, January 9, 2012**  
**Lecture Video 12**

- 18. *In situ* Hybridization: Applications and Techniques (Dr. Blancato)**

**Monday, January 16, 2012**

**Lecture Video 13**

**19. PCR Methodology: Principles, Optimization and Applications (Dr. Leppert)**

**Lecture Video 14**

**20. Real Time PCR (Dr. Kulesh)**

**Monday, January 23, 2012**

**Laboratory 8 – 12:00 – 5:00**

**20. *In Situ* Hybridization Techniques (Dr. Blancato, Mr. Baker)**

**Monday, January 30, 2012**

**Laboratory 9 – 12:00 – 5:00**

**21. PCR/RT-PCR/Real Time PCR (Dr. Kulesh)**

a. Amplification of DNA

b. Amplification of RNA: Reverse Transcription PCR (RT-PCR)

c. Real Time and Quantitative PCR

**Monday, February 6, 2012**

**Laboratory 10 – 12:00 – 5:00**

**22. PCR/RT-PCR/Real Time PCR Cont'd (Dr. Leppert, Dr. Kulesh)**

**Monday, February 13, 2012**

**Laboratory 11 – 12:00 – 5:00**

**23. Gene Expression Analysis: Microarrays, Micro RNAs (Ray Manyoky)**

**Monday, February 27, 2012**

**Laboratory 12 – 12:00 – 5:00**

**24. Gene Expression Analysis: Microarrays, Micro RNAs Cont'd (Qiagen)**

**Monday, March 5, 2012**

**Lecture Video 15**

**25. Introduction to Proteomics (Dr. Strader)**

**Lecture Video 16**

**26. Proteomics: First and Second Dimension Gel Electrophoresis (Dr. Diez)**

**March 12, 2012**  
**Laboratory 13 – 12:00 – 5:00**

- 27. Proteomics (Dr. Diez)**
- a. First Dimension Gel Electrophoresis
  - b. Second Dimension Gel Electrophoresis

**Monday, March 19, 2012**  
**Lecture Video 17**

- 28. Cells of the Immune System (Dr. Leitner)**

**Monday, March 26, 2012**  
**Lecture Video 18**

- 29. Immunoassays: Techniques and Applications (Dr. Leitner)**

**April 2, 2012**  
**Monday, Laboratory 14 – 12:00 – 5:00**

- 30. Immunoassays: ELISA, Western Analysis, Immunofluorescence (IFA);  
Fluorescence Activated Cell Sorting (FACS) (Dr. Bergmann, Dr. Leitner)**
- a. ELISA
  - b. Western Analysis: PAGE, Blotting, Antibody Detection
  - c. Immunofluorescence (IFA)
  - d. Fluorescence Activated Cell Sorting (FACS) (Demo)

**Monday, April 9, 2012**  
**Laboratory 15 – 12:00 – 5:00**

- 31. Immunoassays: ELISA, Western Analysis, Immunofluorescence (IFA);  
Fluorescence Activated Cell Sorting (FACS) Cont'd (Dr. Bergmann, Dr. Leitner)**

**Monday, April 16, 2012**  
**Lecture Video 19**

- 32. Introduction to Transgenic Technology (Dr. Peters)**

**Monday, April 23, 2012**  
**Lecture Video 20**

- 33. Microinjection and Transgenic Production (Dr. Peters)**

**Monday, April 30, 2012**  
**Lecture Video 21**

**34. Informatics (Dr. Natale)**

**Monday, May 7, 2012**  
**Laboratory 16 – 12:00 – 5:00**

**35. Bioinformatics (Dr. Natale)**

a. BLAST, Multiple Sequence Alignments, Pattern and Profile Search, Peptide

**Monday, May 14, 2012**  
**Lecture Video 22**

**36. Stem Cells: Introduction to Adult and Embryonic Stem Cells (Dr. Bressler)**

**Monday, May 21, 2012**  
**Lecture Video 23**

**37. Introduction to Nanotechnology in Cancer (Dr. Patri)**

**Junior Scientist Pipeline Training Program  
Staff List**

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