MEDICAL MOLECULAR DIAGNOSTICS
BIOSC 286
Winter Quarter 2011

Instructor: Erica Sciara
Office: 2930
Office hours: Tues & Thurs, 4-5pm
Lab: Tues & Thurs 5-8pm
Lab room: 2930
Dates: Feb 8 - March 10, 2011
Email: esciara@shoreline.edu

Instructor Homepage address: http://shoreline.blackboard.com

Course description: This 5 week course is designed for Biotech, MLT, Nursing students, or incumbent workers to gain insight into the technology behind modern genetic screening for inherited diseases and testing for pathogenic infections such as HIV. It is a laboratory-based course providing practical experience using the molecular biology techniques, such as PCR and ELISA, now commonly used for medical diagnostic assays. Emphasis will be placed on understanding theory, experimental design, interpretation of results, and the limitations of these assays.

Your grade will be evaluated as follows:

<table>
<thead>
<tr>
<th>Lab notebook</th>
<th>65 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly questions</td>
<td>40 pts</td>
</tr>
<tr>
<td>Group presentations</td>
<td>35 pts</td>
</tr>
<tr>
<td>Lab quizzes (2 total, 30 pts each)</td>
<td>60 pts</td>
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<tr>
<td>Total</td>
<td>200 pts total</td>
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Your grade is based on the following SCC scale:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
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<th>Grade</th>
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<tbody>
<tr>
<td>95-100</td>
<td>4.0</td>
<td>84</td>
<td>2.9</td>
<td>73</td>
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<tr>
<td>94</td>
<td>3.9</td>
<td>83</td>
<td>2.8</td>
<td>72</td>
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<tr>
<td>93</td>
<td>3.8</td>
<td>82</td>
<td>2.7</td>
<td>71</td>
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<tr>
<td>92</td>
<td>3.7</td>
<td>81</td>
<td>2.6</td>
<td>70</td>
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<tr>
<td>91</td>
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<td>80</td>
<td>2.5</td>
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<td>90</td>
<td>3.5</td>
<td>79</td>
<td>2.4</td>
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<td>89</td>
<td>3.4</td>
<td>78</td>
<td>2.3</td>
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<tr>
<td>88</td>
<td>3.3</td>
<td>77</td>
<td>2.2</td>
<td>66</td>
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<tr>
<td>87</td>
<td>3.2</td>
<td>76</td>
<td>2.1</td>
<td>65</td>
</tr>
<tr>
<td>86</td>
<td>3.1</td>
<td>75</td>
<td>2.0</td>
<td>63-64</td>
</tr>
<tr>
<td>85</td>
<td>3.0</td>
<td>74</td>
<td>1.9</td>
<td>61-62</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>59-60</td>
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</tbody>
</table>
**Required:** (1) one blue National Brand Chemistry Notebook *with pre-numbered pages.* Available in the bookstore, item #43-571, 120 pages, 9¼" x 7¼". Failure to obtain the correct notebook will result in 10% deduction in the final notebook grade.

(2) one box of gloves.

**POLICIES**

**Protocols and Weekly readings:**
There is no textbook or lab manual required for this course. All weekly readings and lab protocols will be made available on the course website (under “Course Materials”) throughout the quarter. **Please note that it is the student’s responsibility to print out any materials needed for class.**

**Lab notebook:**
- Maintenance of a well-documented notebook is critical for doing molecular research. In a well-prepared notebook, all of the pertinent details of an experiment can be easily retrieved by the researcher and by anyone else who reads the notebook. It should be possible for anyone reading your notebook to repeat the experiment without referencing any other sources.

****Come to class with that day’s protocol written in your notebook. Do not tape printed protocols in your lab manual. You are expected to be familiar with the protocols you will be using each day.***

- Random checks on notebooks can occur at any time, so be sure to maintain your record-keeping. Come to class prepared! These checks will go toward your final notebook score.

**Tips for success with your lab notebook:**
- **Write your name and class (BioSc 286) inside the front cover of your notebook**
- Leave the first page blank—this will become your Table of Contents
- WRITE all lab entries on the RIGHT side of the page. Leave the left side blank for class notes.
- Always date each entry in the upper right hand corner
- Provide a short title for each lab and a brief description of the day’s objectives.
- Materials and methods are all in the details! **It is better to put too many details in the notebook rather than not enough detail.** Include company/catalog #s, reaction temperatures, solution concentrations and all data, including labeled gel pictures and absorbance readings.
• Briefly summarize the findings of your data and any conclusions or findings you have made.
• Record all experiments (even those that fail)
• Use pen, never pencil

**Weekly questions:**
The weekly questions are designed to prepare you for the upcoming lab session; participation is required and is a portion of your final grade. Questions will be posted under the “Assignments” section of Blackboard and will consist of a mixture of short answer and discussion questions. Responses to these questions should be well-reasoned, thoughtfully produced and in your OWN words. Do not copy and paste information found on the internet.

Short answers are not to exceed 5-7 sentences in length. Please type your responses.

Tips for success with short answer questions:
• Consult the following week’s protocol--often there will be helpful links at the bottom.
• Consult the current week’s readings.
• Search the web for credible sources!

Discussion questions are also to be typed unless they require drawing diagrams or making calculations. **Weekly questions are due in the first 5 minutes of the following Tuesday class.**

Late assignments are subject to a 20% per day penalty.

**Quizzes:**
Two quizzes will be given. Each quiz will test your understanding of the readings and techniques covered in the lab. Each quiz is worth 30 points.

**Group presentations:**
Presenting your results is a critical part of life in the lab. After each experiment is completed, BOTH you and your lab partner will give a brief, informal report to the class detailing the results and explaining any conclusions you have made. Participation in both “interpretation of results” days will be worth a total of 10 points (5pts each).

In addition, you and your lab partner will be required to present one peer-reviewed journal article to the class. This exercise is intended to facilitate your independent research into subjects that interest you, your ability to work in groups, and your ability to present your ideas to others. I encourage you to use your down-time between experiments to work on your presentation. It is worth 25 points and will occur on **Tuesday, March 1.** Further details will be provided in class.
Lab citizenship:
As a member of this lab, you are a scientist-in-training. Therefore, I will expect you to behave as a considerate and productive citizen of our lab community. Some etiquette guidelines include, but are not limited to:

- Wearing all protective equipment and following safety guidelines when working with potentially infectious agents.
- No food or drink in the lab. This includes gum.
- Cleaning up after yourself following every experiment: washing and returning your station’s equipment (e.g., beakers, metal spatulas, etc), as well as wiping down other work areas for the next user (e.g., weighing chemicals or using the spectrophotometer).
- ALIQUOTING from stock solutions.
- Sharing lab equipment with labmates.
- Being respectful of lab mates in both your words and actions.

Five points of your notebook grade will go toward your participation in the lab regarding lab citizenship. Violation of lab rules will result in loss of points.

Attendance:
Attendance is critical for success in this course. Barring exceptional and documented circumstances, presentations and quizzes can not be rescheduled or made up. Missing a class will result in a zero grade for any materials or presentations due that day. If, for some unforeseen reason, you must miss lab, you may submit assignments electronically via email. Be sure to submit these before their due date/time. Also, be sure to email your lab partner and let them know you won’t be attending class.

Plagiarism:
Plagiarism will not be tolerated. All lab notebook entries and discussion questions should be in your own words. Copying from your lab partner’s notebook, internet sources, textbooks, journal articles or any other text document written by someone else is considered plagiarism.

Safety:
Because we will be working with human blood samples in this class, it is considered a blood-borne pathogens lab. You will be provided with face shields, gloves and lab coats, and will be expected to wear these at all times while handling blood samples. You will also be required to read the Shoreline Bloodborne Pathogen Policy and sign that you understand the safety guidelines and rules of this lab.
The lab schedule can be found on the following page.

<table>
<thead>
<tr>
<th>Date***</th>
<th>Lab Topics</th>
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<tbody>
<tr>
<td>Tues, Feb. 8</td>
<td>Introduction, syllabus, lab safety</td>
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<tr>
<td></td>
<td>Overview of molecular diagnostics, components of blood</td>
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<td></td>
<td><em>prepare, stain and view bloodsmear</em></td>
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<tr>
<td>Thurs, Feb. 10</td>
<td>*gDNA extraction from human blood *</td>
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<td><em>spectrophotometer quantification of gDNA</em></td>
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<tr>
<td>Tues, Feb. 15</td>
<td>Principle and theory behind PCR, Diagnostic applications of PCR,</td>
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<td></td>
<td><em>Set up Sex-typing PCR reaction, run</em></td>
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<td></td>
<td><strong>PCR question set #1 due</strong></td>
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<tr>
<td>Thurs, Feb. 17</td>
<td>Running gel, interpreting results of PCR,</td>
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<td></td>
<td><em>pour and run 1xTAE gels, stain, photograph</em></td>
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<td></td>
<td><strong>Primer design Q &amp; A (come with questions)</strong></td>
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<tr>
<td>Tues, Feb. 22</td>
<td>Interpretation of results: troubleshooting, importance of controls,</td>
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<td></td>
<td>finish PCR section</td>
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<td><em>Group presentation of PCR results</em></td>
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<td></td>
<td><strong>Quiz #1</strong></td>
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<tr>
<td></td>
<td><strong>Primer design question set #2 due</strong></td>
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<tr>
<td>Thurs, Feb. 24</td>
<td>Principle and theory behind ELISA, Applications of ELISA analysis,</td>
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<td></td>
<td>Blood typing using ELISA</td>
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<td><em>blood agglutination assay</em></td>
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<td><em>calculate serial dilutions</em></td>
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<tr>
<td>Tues, Mar. 1</td>
<td><strong>Journal article presentations</strong></td>
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<td></td>
<td><strong>Question set #3 due</strong></td>
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<tr>
<td>Thurs, Mar. 3</td>
<td><em>coat plates with antigen</em></td>
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<td></td>
<td><em>Wash the plates and add blocking buffer</em></td>
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<tr>
<td>Tues, Mar. 8</td>
<td><em>Wash the plates/add antigen conjugate</em></td>
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<tr>
<td></td>
<td><em>Wash, add substrate</em></td>
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<td></td>
<td><em>read plate in plate reader</em></td>
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<td></td>
<td><em>prepare standard curve for notebooks</em></td>
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<td></td>
<td><strong>Question set #4 due</strong></td>
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<tr>
<td>Thurs, Mar. 10</td>
<td><em>Group presentation of ELISA results</em></td>
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<tr>
<td></td>
<td><strong>Turn in lab notebooks,</strong></td>
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<tr>
<td></td>
<td><strong>Quiz #2</strong></td>
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</tbody>
</table>

***Based upon the progression of the experiments, this schedule is subject to change.