

MICB 448A or 448B – Directed Studies (3 credits Library Project Course)

The three – credit MICB 448 can be a laboratory research project or a library research project. The library project is fitted into one term or approximately 200 hours. In either course the students make arrangements to work under the supervision of a Microbiology and Immunology faculty member. The intent of the courses is to provide formal research experience and develop skills for doing scientific research in that field. To develop these skills the student should have regular meetings with the faculty supervisor and/or the project supervisor

The major learning outcomes of the MICB 448A or MICB 448B library project courses are:

- Student researchers should be able to:
 - Apply critical thinking skills to a research problem
 - Formulate research questions as the project proceeds.
 - Locate relevant reported information to assess the research questions.
 - Integrate observations and explanations to relate the reported observations to each research question.
 - Link experimental results to experimental questions to draw accurate conclusions, recognize the limitations of the results and recognize future significant directions of the research
- Student researchers should be able to effectively communicate their research in oral and written form.

To complete the course the students must:

- Contact eligible faculty members and discuss the possibilities of working under the supervision of that faculty member. When there is a mutual agreement between the faculty member and the student then the student reports that agreement to the program coordinator and registers for the course.
- Submit a written statement of the proposed project to the supervisor and the course coordinator.
- Submit a research article or review articles that analyses the reported results and observations to the supervisor and the Undergraduate Program Advisor.
- Defend the project and the report in a formal oral exam attended by the faculty supervisor and another faculty member.

The grade will consider:

- The demonstrated critical understanding of the observations.
- The intellectual contribution of the student toward the development of the project
- The quality of the written report and analysis

Eligible faculty supervisors include: the research faculty listed in the academic calendar at: <http://www.calendar.ubc.ca/vancouver/index.cfm?tree=12,215,413,575>

Faculty member

Summarized research interests:

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| Ninan Abraham | Lymphocytes, cytokines, molecular biology, proteomics, interleukin |
| Tom Beatty | Molecular biology and bio-photovoltaic applications of bacterial photosynthetic complexes; molecular biology of gene transfer agents |
| Sean Crowe | Geomicrobiology |

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| Julian Davies | Antibiotics, secondary metabolites |
| Martin Hirst | Epigenetics |
| Lindsay Eltis | Bacterial catabolism of lignin and steroids, <i>Mycobacterium tuberculosis</i> , biocatalysts, actinobacteria genomics |
| Rachel Fernandez | Molecular pathogenesis, molecular biology, bacterial disease |
| Brett Finlay | Microbial pathogenesis, molecular biology, microbiota |
| Erin Gaynor | Bacterial molecular pathogenesis, gene expression, gene array |
| Mike Gold | Molecular Immunology, signal transduction |
| Robert Hancock | Antibiotic resistance; Anti-biofilm peptides; Immunomodulation; Innate Immunity; Complex adaptations in bacteria : stress, swarming motility; biofilm formation |
| Ken Harder | Innate immunity, dendritic cells, gut immunology, innate lymphocytes, tumour immunology, immunotherapy |
| Marc Horwitz | Innate immunity, virology, immunology |
| Francois Jean | Molecular virology; human enveloped viruses; host-virus interactions; broad-spectrum antivirals; therapeutic microRNAs; viral-disease biomarkers |
| Wilf Jefferies | Molecular Immunology, MHC antigen properties |
| Pauline Johnson | Regulation of immune responses, Inflammation, Mucosal Immunology |
| Jim Kronstad | Mycology, genetics, pathogenicity, plant-microbe interactions, fungal molecular genetics |
| William Mohn | Bacterial physiology, microbial diversity, drug targets |
| Michael Murphy | Microbial iron physiology, Enzymes, Structural biology |
| Georgia Perona-Wright | T cells, cytokines and parasite & viral infections |
| William Ramey | Microbial physiology, applied microbiology |
| John Smit | Surface gene expression, biotechnology, molecular biology |
| Curtis Suttle | Marine viruses, marine ecology |

Details of the faculty research can be found at the research links in www.microbiology.ubc.ca

Outline for MICB 448 A or B Library Projects

1. Arrange to work for three months on a library research thesis project supervised by a faculty member of the Microbiology and Immunology Department. The project may concern any mutually agreeable topic in the area of microbiology and immunology. Either the student or the faculty supervisor can propose the topic but it should fall within the interests of the supervisor.

2. The thesis should use documented archival information available in library articles, interviews, web sites or public archives to analyse, compare or test a specific research hypothesis rather than simply describe a process or review a subject area.
3. The student and the supervisor should meet weekly or biweekly for the first two months to discuss progress on the topic, decide about changes to the topic and consider changes to the approach to the topic as more information is collected. During the third month, the thesis should be written and presented in a final processed form. The supervisor's role at these meetings is to provide advice about your thoughts, observations and problems rather than lead the development of the thesis.

The typical timetable for developing the thesis involves:

- a. choose a supervisor and a specific topic. Provide the name of the supervisor and the topic to the undergraduate advisor in Microbiology and Immunology to retain your registration in the course.
 - b. by the third week of class provide your supervisor with a short list of the relevant papers or other information that you have read, a brief overall summary of the information and the major points that apply to your thesis.
 - c. by the fourth week provide a list of additional papers or information that you have reviewed, a brief summary of the information and the major points that apply to your thesis.
 - d. by the fifth week provide a list of additional papers or information that you have reviewed as well as the proposed title of the thesis and a proposed outline. The proposed outline should include section titles indicating the major aspects of the topics that you will cover. Include a short section to indicate the topics still being researched.
 - e. by the seventh week provide a list of additional papers or information that have been reviewed and a finished outline. The finished outline should include the section headings and a summary of the information covered under each section heading.
 - f. by the eleventh week the draft of the thesis is due.
 - g. by the beginning of the fourteenth week submit two copies of the final copy of the thesis to the supervisor and one copy to the undergraduate advisor in Microbiology and Immunology.
 - h. after receiving the report, the supervisor will arrange to have the thesis read by a knowledgeable examiner then set an oral exam.
 - i. the oral exam consists of a short formal 10-15 minute presentation (seminar) by the student followed by a question period where the chosen examiner and the supervisor can ask questions about the oral presentation, the written thesis and the general related background knowledge. The oral presentation should be scheduled to allow a few days for the examiner to read the written report and for the student to prepare any necessary slides for explaining the project details. The oral presentation should cover the essential ideas, relevant background, major observations and conclusions from the research project.
4. The reports should be written as a research article or a review using the style prescribed by the American Society for Microbiology. The final paper should normally be 15 - to - 20 pages of text, including the references. There should be a minimum of 20 relevant, original references cited. All citations or figure legends should follow the style of the Journal of Bacteriology or the Journal of Immunology. The report should include
 - a. a brief summary at the beginning, an introduction
 - b. a section with relevant data, explanations and discussion
 - c. a section with the major conclusions
 - d. a section indicating future research directions.
 - e. a section of citations that must include some papers published within the last year, unless nothing that recent is available in that particular subject field.
 5. The report will be graded for
 - a. completeness (has all the relevant information been discussed)

- b. clarity (is the report clear and concise)
 - c. grammar and spelling
 - d. understanding of the reported results and demonstration of explicit connections between those reported results and the purpose of the study.
6. The oral exam should count 25 % of the final grade. The final grade will be penalized by 5% for each missed deadline or progress report.
7. The grade submitted by the faculty supervisor to the Senior Undergraduate Program Advisor will be a cumulative grade determined by your effort in the research, your understanding of the work and relevant background, the quality of your reports, and your performance in the oral exam. A first class mark greater than 80% should represent a first class achievement in the work, the reports and the oral exam.
8. A departmental copy of the report must be submitted to the Senior Undergraduate Advisor before the grade is submitted for the course.

Grading Rubric for MICB 448

The **grade between 95 - to - 100%** represents outstanding work. To fall in this range the student and the work must demonstrate all of the following features.

- The **student could work relatively independently**. The student demonstrated that they knew the limitations of the study, the place that the work fits in the field and the significance of the project.
- The student consistently participated in the development of the project by researching background outside any original references provided by the supervisor. Throughout the project the student contributed significant insight into the results and technical problems rather than passively expecting their supervisor to interpret their results, provide explanations and solve their problems. If there was no dialogue concerning the meaning of the results during the meetings of the supervisor and the student then the student was probably not an active participant in the ongoing development of the project.
- The first copy of the final report was organized so that it had a professional appearance and excellent flow. There were no significant spelling or grammatical errors, all the important articles were included and the irrelevant papers were omitted. Critical thought and accurate consistent analysis was evident. The discussion clearly referred to the reported facts and clearly related the those facts to the purpose of the study. **The conclusion was an accurate statement that was supported by the actual results discovered in the study.** The conclusion addressed the purpose of the study.
- The style was appropriate for an ASM journal or review submission and the content was placed in appropriate sections.

The **grade between 85 - to - 94%** represents very good work. To fall in this range the student and the work has the following features.

- The student demonstrated that they knew the limitations of the study, the place that the work fits in the field, the significance of the project and the next steps in the project.
- The student consistently participated in the development of the project by researching background outside any original references provided by you. Throughout the project the student has been contributing significant insight into the results rather than passively expecting you or their immediate lab supervisor to interpret their observations and provide explanations. During meetings between the student and the supervisor there was significant dialogue concerning the observations.
- The first copy of the final report was organized so that it had reasonable flow. There might have been **a few spelling or grammatical errors, but the important observations and controls were included** and irrelevant observations were omitted. **Some critical thought and analysis was**

- evident and there were adequate references to relate the observations and conclusions to the original questions. The conclusion was an accurate statement that was supported by the actual results discovered in the study.** The conclusion addressed the purpose of the study.
- The style was appropriate for an ASM journal or review submission and the content was placed in appropriate sections.

The **grade between 80 - to - 84%** represents good work. To fall in this range the student and the work has the following features.

- The student demonstrated that they knew the limitations of the study, the place that the work fits in the field, the significance of the project and the next steps in the project.
- The student interrelated the reported observations and contributed some insight into the results **but tended to rely on the supervisor to provide explanations and solve their problems. There was some dialogue but the dialogue was limited.**
- The first copy of the final report was organized so that it had reasonable flow. **There might have been a few significant spelling or grammatical errors. Most of the important articles were included but the coverage was uneven so that one or two important articles might have been deemphasized or some irrelevant observations might have been included. Some critical thought and analysis was present and there were adequate references to relate the observations and conclusions to the field.**
- The style was appropriate for an ASM journal submission and the content was placed in appropriate sections.

The **grade between 76 - to - 79%** represents reasonable work. To fall in this range the student and the work has the following features.

- The student demonstrated that they knew the limitations of the study, the place that the work fits in the field and the significance of the project.
- The student interpreted the observations and contributed some insight into the observations **but tended to rely on the supervisor to provide explanations and integrations. There might have some dialogue but it was limited.**
- The first copy of the final report **was a bit difficult to follow because the presentation did not flow logically or some key points were not very clear. There might have been a few significant spelling or grammatical errors.** Most of the important articles were included but **the coverage was uneven so that one or two important references were missing or several irrelevant references were included. The critical thought and analysis was limited but there was some integration of the reported facts and there were adequate references to relate the observations and conclusions to the field.**
- The style was appropriate for an ASM journal or review submission and the content was placed in appropriate sections.

The **grade between 72 - to - 75%** represents adequate work. To fall in this range the student has done the work but had two or more of the following limitations.

- The student contributed some insight into the results and technical problems but **tended to rely on the supervisor or other students to provide explanations and solve their problems.**
- The student put in at several hours of active work per week on the project.
- The first copy of the final report **was sloppy and poorly organized so it did not flow.**
- **Critical thought and analysis was present but was very limited so the work tended to be descriptive rather than analytical. Documented relationships between the field and the research were limited to one or two novel references. The analysis was difficult to follow because the arguments were not consistently related to the observations or contradictory observations were not recognized or the conclusion was inappropriate for the evidence.**
- The style was generally appropriate for an ASM journal or review submission but the content placed in the various sections was not consistently appropriate.

Grades below 72% represent poor work or effort. They are suitable if

- The student did not understand the reported results or study in relation to the field.
- **The report is difficult to read because it was not focused on the research question or it had numerous grammatical problems or it missed many potential reports or it was mostly just descriptions with no significant critical thought and analysis.**

Grades of 50- 55% represent marginal work or understanding

- The student did some work, completed the report and the exam but did not understand the project or the meaning of the reported observations.

Grades below 33% indicate that the student did not complete the report or the oral exam.