Description: Immunology and Microbial Pathogenesis

<table>
<thead>
<tr>
<th>Subject</th>
<th>Cat-nbr</th>
<th>Class</th>
<th>Term</th>
<th>Mode</th>
<th>Units</th>
<th>Campus</th>
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<tr>
<td>BIO</td>
<td>3315</td>
<td>30998</td>
<td>1, 2004</td>
<td>ONC</td>
<td>1.00</td>
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Academic group: FOSCI
Academic org: FOS002
Student contribution band: 2
ASCED code: 010911

STAFFING
Examiner: TK Mukkur
Moderator: Michael Kotiw

REQUISITES
Pre-requisite: BIO2205

RATIONALE
The course aims to provide a thorough understanding of the essential principles of immunity, the ability to distinguish self from non-self antigens, immunochemistry, immunobiology, immunogenetics, abnormal immune responses including autoimmunity and allergies/hypersensitivities and cancer immunology. Emphasis will also be given to principles unpinning prokaryotic-eukaryotic cell interactions which contribute to the development of therapeutic strategies against devastating diseases of humans or animals.

SYNOPSIS
This course emphasises the concepts underpinning humoral or cellular host defence mechanisms which respond to intrusion by foreign invaders including induction of protection against devastating microbial diseases or altered/mutated self-antigens or -cells. The course includes a study of innate defence mechanisms, antigenic specificity, induction of humoral and cellular immune responses, immunoglobulin structure, function and genetic basis of antibody diversity, the role of the immune system in health and disease including cell-mediated immunity, hypersensitivity reactions, autoimmunity, immune tolerance and cancer immunology. The course also leads students to discover the significance of the mechanisms of microbial pathogenesis at the prokaryotic-eukaryotic cell level in the development of the new generation vaccines against some of the biggest scourges affecting human or animal life on this planet. The practical component of the course is intended to provide students with hands-on experience with molecular and cellular immunological techniques of relevance to aspects relating to the fields of microbial, animal and plant
biotechnologies and biomedical sciences, thus providing students with alternative career choices for their future.

OBJECTIVES
On completion of this course students will be able to:

- demonstrate an appreciation of the basic principles and molecular mechanisms of microbial pathogenesis including adhesion and invasion;
- demonstrate the role played by the bacterial virulence factors including protein toxins representing different secretion systems as agents of disease and probes of eukaryotic cell behaviour;
- describe different classes/subclasses of immuno-globulins/antibodies, their structure and functions;
- demonstrate an understanding of the concept of antibody specificity and its chemical basis;
- describe the role played by the innate defence mechanisms including inflammatory response, antiphagocytic mechanisms, complement and the role played by cytokines in protection against infectious disease and cancer;
- demonstrate an understanding of the genetic basis of diversity of effector molecules participating in the induction of immune responses;
- describe components of the complement system and its function in host defence;
- describe the current concepts in the generation of humoral and cellular immune response;
- describe the phenomenon of autoimmunity as a disease process;
- describe the T-B cell paradigm particularly in relation to tuberculosis and leprosy;
- describe different types of hypersensitivities and their role in health and disease;
- describe the current concepts in vaccine development and their success in today's world;
- describe the immunological basis for rejection/acceptance of cell/organ transplants;
- demonstrate an understanding and describe the action of cytokines including the bases of endotoxin-induced cytokine-induced injury;
- discuss the role played by immunochemical and immunobiological techniques in the development of new generation vaccines;
- describe the current state of developments in the field of cancer immunology;
- demonstrate the concept of humanised monoclonal antibodies and discuss their significance of immunotherapeutics;
- purify immunoglobulins and conjugate them to enzymes or fluorescent dyes for use in immunofluorescence or enzyme-linked immunosorbent assays;
- perform the basic serological techniques such as those used in immunohaematology and for the diagnosis of infectious diseases;
- perform dot and/or western blotting to enable identification of antigens and demonstration of antibody specificity.
TOPICS

Description Weighting (%)

1. Eukaryotic cell response to prokaryotic assault in model systems involving: Microbial adhesion; Bacterial invasion; Viral invasion; Bacterial protein secretion systems as agents of disease. 15.00

2. Molecular and Cellular Basis of Immune Response; Innate Defence Mechanisms; Antigens/Haptens: Serological Basis of specificity; Cells and Tissues of the Immune System; Complement System; Immunoglobulin Structure and Function; Molecular Basis of Antibody and MHC Diversity; Hypersensitivity Reactions and Dilemmas; Cytokines; Autoimmunity vs. tolerance; Oncogenes and Cancer Immunology; Immunological Reagents in Disease Diagnosis and Therapeutics; New Generation Preventative Immunological Strategies. 85.00

TEXT and MATERIALS required to be PURCHASED or ACCESSED:

ALL textbooks and materials are available for purchase from USQ BOOKSHOP (unless otherwise stated). Orders may be placed via secure internet, free fax 1800642453, phone 07 46312742 (within Australia), or mail. Overseas students should fax +61 7 46311743, or phone +61 7 46312742. For costs, further details, and internet ordering, use the 'Textbook Search' facility at http://bookshop.usq.edu.au click 'Semester', then enter your 'Course Code' (no spaces).

Mukkur, T K 2004, Practical Immunology, USQ Publication, Toowoomba.

REFERENCE MATERIALS:

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

Baron, S (ed) 1996, Medical Microbiology, 4th edn, University of Texas, Galveston.
Glick, B R & Pasternak, J J 1994, Molecular Biotechnology: Principles and applications of Recombinant DNA, ASM Press, Washington, DC.


**STUDENT WORKLOAD REQUIREMENTS:**

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>HOURS</th>
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<tbody>
<tr>
<td>Examinations</td>
<td>5.00</td>
</tr>
<tr>
<td>Laboratory or Practical Classes</td>
<td>24.00</td>
</tr>
<tr>
<td>Lectures</td>
<td>26.00</td>
</tr>
<tr>
<td>Private Study</td>
<td>103.00</td>
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<td>Tutorial</td>
<td>2.00</td>
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**ASSESSMENT DETAILS**

<table>
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<tr>
<th>Description</th>
<th>Marks out of</th>
<th>Wtg(%)</th>
<th>Due date</th>
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<tbody>
<tr>
<td>2 HR LABORATORY TEST</td>
<td>20.00</td>
<td>20.00</td>
<td>02 Mar 2004</td>
</tr>
<tr>
<td>(see note 1)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3HR CLOSED EXAMINATION</td>
<td>80.00</td>
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<td>END S1</td>
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<td>(see note 2)</td>
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**NOTES:**

1. Examiner to advise the due date for Laboratory Test
2. Examination dates will be available during the Semester. Please refer to the examination timetable when published.

**IMPORTANT ASSESSMENT INFORMATION**

1. Attendance requirements:
   It is the students' responsibility to attend and participate appropriately in all activities (such as lectures, tutorials, laboratories and practical work) scheduled for them,
and to study all material provided to them or required to be accessed by them to
maximise their chance of meeting the objectives of the course and to be informed
of course-related activities and administration. To maximize their chances of
satisfying the objectives of the practical component of the course, students should
attend and actively participate in the laboratory sessions in the course.

2 Requirements for students to complete each assessment item satisfactorily:
   To complete each of the assessment items satisfactorily, students must obtain at
   least 50% of the marks available for each assessment item.

3 Penalties for late submission of required work:
   If students submit assignments after the due date without prior approval then a
   penalty of 10% of the total marks available for the assignment will apply for each
   working day late.

4 Requirements for student to be awarded a passing grade in the course:
   To be assured of receiving a passing grade a student must achieve at least 50% in
   each of the summative assessments and at least 50% of the available weighted
   marks for the summative assessment items.

5 Method used to combine assessment results to attain final grade:
   The final grades for students will be assigned on the basis of the weighted aggregate
   of the marks (or grades) obtained for each of the summative assessment items in
   the course.

6 Examination information:
   In a Closed Examination, candidates are allowed to bring only writing and drawing
   instruments into the examination.

7 Examination period when Deferred/Supplementary examinations will be held:
   Any Deferred or Supplementary examinations for this course will be held in the
   fourth week of the semester following this course offering and the examiner will
   advise students involved in writing of the date time and location of any such
   examination.

8 University Regulations:
   Students should read USQ Regulations 5.1 Definitions, 5.6. Assessment, and 5.10
   Academic Misconduct for further information and to avoid actions which might
   contravene University Regulations. These regulations can be found at the URL
   http://www.usq.edu.au/corporateservices/calendar/part5.htm or in the current USQ
   Handbook.

ASSESSMENT NOTES

9 In accordance with University policy, the examiner may grant an extension of the
due date of an assignment in extenuating circumstances. The faculty will normally
only accept assessments that have been written, typed or printed on paper-based
media. The Faculty will NOT accept submission of assignments by facsimile.

10 Students who do not have regular access to postal services or who are otherwise
disadvantaged by these regulations may be given special consideration. They should
contact the examiner of the course to negotiate such special arrangements.

11 Students, who, for medical, family/personal, or employment-related reasons, are
   unable to complete an assignment or to sit for an examination at the scheduled time
may apply to defer an assessment in a course. Such a request must be accompanied by appropriate supporting documentation. One of the following temporary grades may be awarded IDS (Incomplete - Deferred Examination); IDM (Incomplete - Deferred Make-up); IDB (Incomplete - Both Deferred Examination and Deferred Make-up).

12 In order to attend laboratory classes, students must provide and wear appropriate personal protective equipment. This shall include a laboratory coat, closed in shoes, and safety glasses. Such equipment must be approved by supervising staff. Failure to provide and wear the appropriate safety equipment will result in students being excluded from classes.