University of Dundee                      Mathematics Division

MA52003: Mathematical Physiology


Organization
The course will consist of 23 hours of lectures and 10 hours of seminars (presentations by the students), meeting 3 times per week for 11 weeks. This module is worth 15 SCQF credits (equal to 7.5 ECTS points). We will be using Blackboard for discussions, announcements, posting problems, discussion boards and general administration. So please log in on a regular basis. The module leader, who is responsible for the organisation and teaching of the module, is

Dr Hiroko Kamei
Mathematics Division,
Room Fulton G6
Tel: 01382 – 384476
email: hiroko@maths.dundee.ac.uk

Timetable
All lectures and seminars will be held either in the room G5 or G6 in the Tower Building:

<table>
<thead>
<tr>
<th></th>
<th>Time</th>
<th>Room</th>
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<tbody>
<tr>
<td>Wednesdays</td>
<td>11.00-12.00</td>
<td>G6</td>
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<tr>
<td>Thursdays</td>
<td>11.00-12.00</td>
<td>G5</td>
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<td>Fridays</td>
<td>9.00-10.00</td>
<td>G6</td>
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Syllabus
In this course we will study mathematical models of cellular physiology in metabolism, genetic networks, and electrophysiology. The software package XPPAUT will be introduced to numerically solve and plot the solutions of ordinary differential equations, and bifurcation diagrams.

Biochemical Reactions
Enzyme kinetics (6 lectures)

Genetic Networks
Central Dogma of biology, review of bifurcation theory (2 lectures)
Feedback loops and Oscillation (3 lectures)
Circadian rhythms (3 lectures)
Cell cycle model (3 lectures)

Electrophysiology
The Hodgkin-Huxley model (2 lectures)
The FitzHugh-Nagumo equations (2 lectures)
Small network dynamics of coupled neurons (2 lectures)
Assessment

During the seminars, each student will be asked to make two presentations to the class on a given book section, and a journal paper. The seminars will count for 30% of your module mark. There will be an open-book class test which counts for 30% of your module mark. The remaining 40% will come from a mini-project report, which will be due by the end of April (date to be confirmed). There is no Degree Examination in May for this module. To pass this module will require you to score 50% or more overall.

Feedback

You should make an appointment to see the lecturer if you have a problem regarding the course. You may also bring matters of concern about the course to the attention of the Mathematics Division Staff/Student Committee, which meets once each semester. You will have the opportunity to make constructive comments on the course via an anonymous questionnaire, which will be handed out towards the end of the module.

Reference Books
