1 Summary of Degree Structure

Full details about each programme of study, including the aims, learning outcomes to be achieved on completion, modules which make up the programme and any programme-specific regulations are set out in the programme specifications.

1.1 Degree Programmes

**MOLECULAR BIO SCIENCE DEGREES**

- Biochemistry
- Biomedical Sciences
- Medical Biochemistry
- Molecular Biology

**ORGANISMAL BIO SCIENCE DEGREES**

- Biology
- Ecology and the Environment
- Zoology

**MOLECULAR BIO SCIENCE DEGREES**

**C700 Biochemistry** provides a comprehensive coverage of the principles of biochemistry together with a range of more advanced module options dealing with a broad spectrum of modern and topical developments in animal, microbial and plant biochemistry and molecular biology. A good degree of flexibility is possible in the second and final years and you may also select up to one module unit from those offered by other departments if timetabling allows, and if agreed by the Heads of School/Department in SBS and in the host department.

**B990 Biomedical Sciences.** This degree programme focuses on understanding the biological basis of human disease and is primarily designed for students considering employment in biomedical research. The first year provides a core background in a range of subjects including biochemistry, physiology, cell biology, molecular biology and genetics. In the second and particularly the final year you focus on specialist medical subjects such as the neurosciences, fundamentals of disease diagnostics and the molecular basis of inherited disease.

**C741 Medical Biochemistry** emphasises the importance of biochemistry in medicine, particularly in relation to understanding the molecular basis of disease and how this can lead to the development of novel therapeutic strategies. In addition to the biochemistry core modules, you take core modules in physiology, cell biology and genetics in the first year and the medically-orientated options in the second and final years. These include biochemical aspects of immunology and neurobiology, the molecular basis of inherited disease and embryology.

**C701 Molecular Biology** emphasizes the essence of the molecular mechanisms that control life processes. A common first year of core units is followed by a selection of optional and additional core modules in molecular biology (including applied aspects of the subject) and biochemistry. In the final year, students take advanced level modules that focus on molecular biology, cell biology, molecular and medical microbiology, human molecular genetics and inherited diseases.
You will also have a choice from a selection of final year projects in either biomedical, environmental, microbial or plant sciences in which molecular biology approaches are used.

ORGANISMAL BIO SCIENCE DEGREES

**C100 Biology** provides a comprehensive coverage of most aspects of biology ranging from the physiological to the ecological. A common first year builds the necessary foundation for more specialist modules in the second and third year. These can be selected to maintain a broad-based degree or to concentrate on areas which are predominantly ecological, physiological, or organismal.

**C150 Ecology and the Environment** is the study of interactions between plants and animals and their environments. A common first year provides the necessary foundation for a selection of second and third year modules which cover diverse aspects of ecology including both terrestrial and aquatic ecosystems, conservation and behavioural ecology.

**C300 Zoology** places particular emphasis on the study of animals. Following a common first year which provides basic training in organismal, ecological and physiological aspects of biology, a range of options is available in the second and third years, which cover the diversity and evolution of animals, their adaptations to different life styles and habitats, how they function and their behaviour.
## 1.2 Modules Offered – School of Biological Sciences RHUL

All first year modules and BS3010 are worth 30 credits. All other modules are 15 credits.

<table>
<thead>
<tr>
<th>MODULE CODE</th>
<th>MODULE NAME</th>
<th>COORDINATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BS1030 (30)</td>
<td>Principles of Molecular Bioscience</td>
<td>Dr J McEvoy</td>
</tr>
<tr>
<td>BS1040 (30)</td>
<td>The Diversity of Life</td>
<td>Dr B Thomas</td>
</tr>
<tr>
<td>BS1050 (30)</td>
<td>Ecology: Animal Behaviour to Environmental Conservation</td>
<td>Dr B Thomas</td>
</tr>
<tr>
<td>BS1060 (30)</td>
<td>Living Systems: Animal and Plant Physiology</td>
<td>Dr J Beauchamp</td>
</tr>
<tr>
<td>BS1070 (30)</td>
<td>Cell Biology and Genetics</td>
<td>Dr P F Devlin</td>
</tr>
<tr>
<td>BS1090 (30)</td>
<td>Biochemistry: The Molecular Basis of Life</td>
<td>Dr W Lucchesi</td>
</tr>
<tr>
<td><strong>Second Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BS2005</td>
<td>Microbiology</td>
<td>Dr S Dissanayeke</td>
</tr>
<tr>
<td>BS2010</td>
<td>Invertebrate Biology: Structure, Behaviour and Evolution</td>
<td>Prof M J F Brown</td>
</tr>
<tr>
<td>BS2020</td>
<td>Plant Life: from Genes to Environment</td>
<td>Dr E Lopez-Juez</td>
</tr>
<tr>
<td>BS2040</td>
<td>Cell Dynamics: Division and Movement</td>
<td>Prof L Bögre</td>
</tr>
<tr>
<td>BS2050</td>
<td>Human Physiology in Health and Disease</td>
<td>Dr J Beauchamp</td>
</tr>
<tr>
<td>BS2060</td>
<td>Developmental Biology</td>
<td>Dr E Lopez-Juez</td>
</tr>
<tr>
<td>BS2090</td>
<td>Insects, Plants and Fungi: Ecology and Applications</td>
<td>Prof A C Gange</td>
</tr>
<tr>
<td>BS2110</td>
<td>Practical Field Ecology</td>
<td>Prof J Koricheva</td>
</tr>
<tr>
<td>BS2120</td>
<td>Biological Data Analysis and Interpretation</td>
<td>Dr S Papworth</td>
</tr>
<tr>
<td>BS2140</td>
<td>Animal Behaviour</td>
<td>Dr S Portugal</td>
</tr>
<tr>
<td>BS2150</td>
<td>Applications of Molecular Genetics in Biology</td>
<td>Dr W Lucchesi</td>
</tr>
<tr>
<td>BS2160</td>
<td>Evolution</td>
<td>Dr F Ubeda de Torres</td>
</tr>
<tr>
<td>BS2001X</td>
<td>Marine Biology</td>
<td>Dr D Morritt</td>
</tr>
<tr>
<td>BS2510</td>
<td>Bioenergetics, Biosynthesis and Metabolic Regulation</td>
<td>Dr J McEvoy</td>
</tr>
<tr>
<td>BS2520</td>
<td>Protein, Structure and Function</td>
<td>Dr M Soloviev</td>
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<tr>
<td>BS2530</td>
<td>Molecular Biology</td>
<td>Dr C Wilkinson</td>
</tr>
<tr>
<td>BS2540</td>
<td>Molecular and Cellular Immunology</td>
<td>Dr W Lucchesi</td>
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<tr>
<td>BS2550</td>
<td>Neuronal Cell Signalling</td>
<td>Dr P Alifragis</td>
</tr>
<tr>
<td>BS2560</td>
<td>Pharmacology and Toxicology</td>
<td>Dr P E Chen</td>
</tr>
<tr>
<td>BS2570</td>
<td>Physical Biochemistry for Life Scientists</td>
<td>Dr M Soloviev</td>
</tr>
<tr>
<td><strong>Third Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BS3010 (30)</td>
<td>Individual Research Project</td>
<td>Prof M J F Brown</td>
</tr>
<tr>
<td>BS3020</td>
<td>Special Study: Dissertation</td>
<td>Dr M Soloviev</td>
</tr>
<tr>
<td>BS3030</td>
<td>Biology of Parasitic Diseases</td>
<td>Dr J Tovar-Torres</td>
</tr>
<tr>
<td>BS3060</td>
<td>Conservation Biology</td>
<td>Dr S Papworth</td>
</tr>
<tr>
<td>BS3090</td>
<td>Entomology</td>
<td>Prof A Gange</td>
</tr>
<tr>
<td>BS3110</td>
<td>Mediterranean Island Conservation and Ecology</td>
<td>Prof M J F Brown</td>
</tr>
<tr>
<td>BS3120</td>
<td>Population and Community Ecology</td>
<td>Prof V Jansen</td>
</tr>
<tr>
<td>BS3160</td>
<td>Behavioural Ecology</td>
<td>Dr R Riesch</td>
</tr>
<tr>
<td>BS3180</td>
<td>Marine Ecology and Biodiversity</td>
<td>Dr D Morritt</td>
</tr>
<tr>
<td>BS3190</td>
<td>Climate Change: plants and the environment</td>
<td>Dr A Devoto</td>
</tr>
<tr>
<td>BS3510</td>
<td>Molecular and Medical Microbiology</td>
<td>Dr S Dissanayeke</td>
</tr>
<tr>
<td>BS3520</td>
<td>Seed Biology</td>
<td>Prof G Leubner</td>
</tr>
<tr>
<td>BS3530</td>
<td>Applications of Advanced Molecular Biology Methods</td>
<td>Prof R S Williams</td>
</tr>
<tr>
<td>BS3540</td>
<td>Cell &amp; Molecular Biology of Cancer</td>
<td>Prof L Bögre</td>
</tr>
<tr>
<td>BS3560</td>
<td>Functional Genomics, Proteomics and Bioinformatics</td>
<td>Dr A Devoto</td>
</tr>
<tr>
<td>BS3570</td>
<td>Human Embryology and Endocrinology</td>
<td>Dr J Murdoch</td>
</tr>
<tr>
<td>BS3580</td>
<td>Cellular and Molecular Neuroscience</td>
<td>Dr P Alifragis</td>
</tr>
<tr>
<td>BS3590</td>
<td>Molecular Basis of Inherited Disease</td>
<td>Dr R Yáñez</td>
</tr>
<tr>
<td>BS3595</td>
<td>Clinical Physiology and Medicine</td>
<td>Dr J Murdoch</td>
</tr>
<tr>
<td>BS3600</td>
<td>Clinical Diagnosis of Disease</td>
<td>Prof P Sharma</td>
</tr>
</tbody>
</table>
1.3 Programme outlines

The programme structure for each of the seven degrees are summarised in the tables over the next few pages. The mandatory (core) modules are indicated as the shaded grey boxes; students must take these modules. Non-mandatory (optional) modules are indicated with the O. Students can select from the optional modules, to give a total of 120 credits for each year.

1.4 Progression conditions

The College regulations that are currently in place regarding Progression are that students who began their degree in 2015 are expected to pass all modules to progress to the next stage of the programme. However, the Sub-Board of Examiners have the discretion to condone narrow fails (30-39%), up to a maximum of 30 credits across stages 1 and 2, if the stage average is at least 40%. Students must pass at least 90 credits in the final stage of the programme, and achieve a final average of 35.00% or above, in order to graduate. Students are generally given two attempts to progress to the next stage. For failed modules, a second attempt may be given as the opportunity to take a resit of the exam, either at the end of the summer (late August, early September), or in May the following year. Alternatively, students may be given the opportunity to repeat a failed module in attendance. Summer resits are normally only offered to students who have failed to meet the requirements to progress by up to 30 credits, and who would then be able to progress. The decision on which of these option(s) to give to students who do not progress is at the academic judgement of the Sub-Board of Examiners, who consider all students anonymously. Extenuating circumstances are considered in a separate pre-Sub-Board meeting, and recommendations from this meeting are fed into the Sub-Board meeting in order to be able to take action, if considered necessary.

1.5 Calculation of the final degree classification

Degrees at RHUL are awarded on the basis of the final average mark. At present, the final average is calculated as a 0 : 1 : 2 ratio of first : second : third year results. Therefore, first year results do not count towards the final degree outcome, but are important in underpinning the studies of second and third year.

Full details of the Undergraduate Regulations are available from the College website.
MOLECULAR BIOSCIENCE DEGREES  
Second Year Module Combinations - for 2017/18

The list of mandatory (core, grey shaded box) and non-mandatory (optional, O) modules available for each degree programme is given below. Mandatory modules must be completed in order to qualify for that degree programme. Each module counts as 15 credits. Students should choose sufficient optional modules to give a total of 120 credits for the year, including mandatory modules.

<table>
<thead>
<tr>
<th>Module</th>
<th>Term#</th>
<th>Biochemistry C700</th>
<th>Medical Biochemistry C741</th>
<th>Molecular Biology C701</th>
<th>Biomedical Sciences B990</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS2005 Microbiology</td>
<td>T2</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>BS2020 Plant Life: from Genes to Environment</td>
<td>T2</td>
<td>O</td>
<td></td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>BS2040 Cell Dynamics: Division and Movement</td>
<td>T2</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BS2050 Human Physiology in Health and Disease</td>
<td>T1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BS2060 Developmental Biology</td>
<td>T1</td>
<td>O</td>
<td>O</td>
<td></td>
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<tr>
<td>BS2150 Applications of Molecular Genetics in Biology</td>
<td>T1</td>
<td>O</td>
<td></td>
<td></td>
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<tr>
<td>BS2160 Evolution</td>
<td>T1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>BS2510 Bioenergetics, Biosynthesis &amp; Metabolic Regulation</td>
<td>T1&amp;T2</td>
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<td></td>
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<tr>
<td>BS2520 Protein Structure &amp; Function</td>
<td>T1</td>
<td></td>
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<tr>
<td>BS2530 Molecular Biology</td>
<td>T1&amp;T2</td>
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<tr>
<td>BS2540 Molecular and Cellular Immunology</td>
<td>T1&amp;T2</td>
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<td></td>
<td></td>
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<tr>
<td>BS2550 Neuronal and Cellular Signalling</td>
<td>T1&amp;T2</td>
<td>O</td>
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<tr>
<td>BS2560 Pharmacology and Toxicology</td>
<td>T2</td>
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<td>O</td>
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<tr>
<td>BS2570 Physical Biochemistry for Life Scientists</td>
<td>T1</td>
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</tbody>
</table>

# The Term in which the module runs is shown as a guide, based on the timetable in 2016-17; this may be subject to change for 2017-18.
# MOLECULAR BIO SCIENCE DEGREES

## Final Year Module Combinations - for 2018/19

The list of mandatory (core, grey shaded box) and non-mandatory (optional, O) modules for each degree programme is given below. Mandatory modules must be completed in order to qualify for that degree programme. Each module counts as 15 credits, apart from BS3010 which is 30 credits. The BS3010 Individual Research Project is non-condonable, and must be passed in order to graduate with that degree. Students should choose sufficient optional modules to give a total of 120 credits for the year, including mandatory modules. Mandatory module selection may be altered for 2018-19, tbc.

<table>
<thead>
<tr>
<th>Module</th>
<th>Term#</th>
<th>Biochemistry C700</th>
<th>Medical Biochemistry C741</th>
<th>Molecular Biology C701</th>
<th>Biomedical Sciences B990</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS3010 Individual Research Project (30 credits)</td>
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<tr>
<td>BS3020 Special Study: Dissertation</td>
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<tr>
<td>BS3030 Biology of Parasitic Diseases</td>
<td>T1</td>
<td>O</td>
<td></td>
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<td>BS3190 Climate Change: Plants and the Environment</td>
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<tr>
<td>BS3230 Circadian Biology - tbc</td>
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<td>BS3410 Industrial Biotechnology - tbc</td>
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<tr>
<td>BS3510 Molecular and Medical Microbiology</td>
<td>T1 &amp; T2</td>
<td>O</td>
<td></td>
<td>O</td>
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<tr>
<td>BS3520 Seed Biology: Molecular &amp; Conservation Biology to Industrial Appns</td>
<td>T1</td>
<td>O</td>
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<tr>
<td>BS3530 Applications of Advanced Molecular Biology Methods</td>
<td>T1 &amp; T2</td>
<td>O</td>
<td></td>
<td></td>
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<tr>
<td>BS3540 Cell &amp; Molecular Biology of Cancer</td>
<td>T1 &amp; T2</td>
<td>O</td>
<td></td>
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<tr>
<td>BS3560 Functional Genomics, Proteomics &amp; Bioinformatics</td>
<td>T1 &amp; T2</td>
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<tr>
<td>BS3570 Human Embryology and Endocrinology</td>
<td>T1 &amp; T2</td>
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<td>BS3580 Cell &amp; Molecular Neuroscience</td>
<td>T1 &amp; T2</td>
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<td>BS3590 Molecular Basis of Inherited Disease</td>
<td>T1</td>
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<td>BS3595 Clinical Physiology and Medicine</td>
<td>T2</td>
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<td>BS3600 Clinical Diagnosis of Disease</td>
<td>T2</td>
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</table>

# The Term in which the module runs is shown as a guide, based on the timetable in 2016-17; this may be subject to change for 2018-19.
## ORGANISMAL BIO SCIENCE DEGREES

### Second Year Module Combinations - for 2017/18

The list of mandatory (core, grey shaded box) and non-mandatory (optional, O) modules available for each degree programme is given below. Mandatory modules must be completed in order to qualify for that degree programme. Each module counts as 15 credits. Students should choose sufficient optional modules to give a total of 120 credits for the year, including mandatory modules.

<table>
<thead>
<tr>
<th>Module</th>
<th>Term#</th>
<th>Biology C100</th>
<th>Zoology C300</th>
<th>Ecology &amp; the Environment C150</th>
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</thead>
<tbody>
<tr>
<td>BS2005 Microbiology</td>
<td>T2</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>BS2010 Invertebrate Biology: Structure, Behaviour and Evolution</td>
<td>T1</td>
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<tr>
<td>BS2020 Plant Life: From Genes to Environment</td>
<td>T2</td>
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<td></td>
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<tr>
<td>BS2040 Cell Dynamics: Division and Movement</td>
<td>T2</td>
<td>O</td>
<td>O</td>
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<tr>
<td>BS2050 Human Physiology in Health and Disease</td>
<td>T1</td>
<td>O</td>
<td>O</td>
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<td>BS2060 Developmental Biology</td>
<td>T1</td>
<td>O</td>
<td>O</td>
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<tr>
<td>BS2090 Insect, Plants and Fungi: Ecology &amp; Applications</td>
<td>T2</td>
<td>O</td>
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<tr>
<td>BS2110 Practical Field Ecology (Term 3 of first year)</td>
<td>T3 of Y1</td>
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<td>BS2120 Biological Data Analysis and Interpretation</td>
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<td>BS2140 Animal Behaviour</td>
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<td>BS2150 Applications of Molecular Genetics in Biology</td>
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<tr>
<td>BS2160 Evolution</td>
<td>T1</td>
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<tr>
<td>BS2001X Marine Biology (summer vacation between Y2 and Y3)</td>
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<tr>
<td>BS2530 Molecular Biology</td>
<td>T1 &amp; T2</td>
<td>O</td>
<td>O</td>
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<tr>
<td>BS2540 Molecular and Cellular Immunology</td>
<td>T1 &amp; T2</td>
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<td>O</td>
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</table>

# The Term in which the module runs is shown as a guide, based on the timetable in 2016-17; this may be subject to change for 2017-18.
**ORGANISMAL BIOSCIENCE DEGREES**  
**Final Year Module Combinations - for 2018/19**

The list of mandatory (core, grey shaded box) and non-mandatory (optional, O) modules for each degree programme is given below. Mandatory modules must be completed in order to qualify for that degree programme. Each module counts as 15 credits, apart from BS3010 which is 30 credits. The BS3010 Individual Research Project is non-condonable, and must be passed in order to graduate with that degree. Students should choose sufficient optional modules to give a total of 120 credits for the year, including mandatory modules. Mandatory module selection may be altered for 2018-19, tbc.

<table>
<thead>
<tr>
<th>Module</th>
<th>Term#</th>
<th>Biology C100</th>
<th>Zoology C300</th>
<th>Ecology &amp; the Environment C150</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS3010 Individual Research Project (30 credits)</td>
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<tr>
<td>BS3020 Special Study: Dissertation</td>
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<tr>
<td>BS3030 Biology of Parasitic Diseases</td>
<td>T1</td>
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<td></td>
<td></td>
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<tr>
<td>BS3060 Conservation Biology</td>
<td>T2</td>
<td>O</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>BS3090 Entomology: Pure and Applied</td>
<td>T1</td>
<td>O</td>
<td>O</td>
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<tr>
<td>BS3110 Mediterranean Conservation and Ecology Field Course</td>
<td>T3 of Y2</td>
<td>O</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>BS3120 Population and Community Ecology</td>
<td>T1</td>
<td>O</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>BS3160 Behavioural Ecology</td>
<td>T2</td>
<td>O</td>
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<tr>
<td>BS3180 Marine Ecology and Biodiversity</td>
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<td>BS3190 Climate Change: Plants and the Environment</td>
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<td>BS3210 Evolutionary Ecology (of Vertebrates) - tbc</td>
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<td>BS3220 Extreme Animal Physiology - tbc</td>
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<td>BS3230 Circadian Biology - tbc</td>
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<td>BS3510 Molecular and Medical Microbiology</td>
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<td>BS3520 Seed Biology: Molecular &amp; Conservation Biology to Industrial Appns</td>
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<tr>
<td>BS3530 Applications of Advanced Molecular Biology Methods</td>
<td>T1 &amp; T2</td>
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<td>BS3540 Cell &amp; Molecular Biology of Cancer</td>
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<td>BS3570 Human Embryology and Endocrinology</td>
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<tr>
<td>GG 3046 Mammals in a Changing World (subject to confirmation)</td>
<td>T1</td>
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# The Term in which the module runs is shown as a guide, based on the timetable in 2016-17; this may be subject to change for 2018-19.
1.6 Module Specifications and Pre-requisites for Second and Third Year Modules

Please note that all timings are based on those for 2016-17. Timetables are subject to change and will only be confirmed by the College immediately prior to the start of the academic year. Information is provided for modules in 2016-17 and is subject to minor amendment as part of the process of continuous improvement.

Module unit specifications can be found at: http://www.rhul.ac.uk/biologicalsciences/informationforcurrentstudents/courseunits/home.aspx

SECOND YEAR MODULES

BS2005 - Microbiology - Dr S Dissanayeke
The module aims to introduce key concepts in microbiology, which encompasses studies in bacteria, viruses, and eukaryotic microbes. The historical milestones in this field of research will be considered, as well as the background of the important methodologies used in microbiology research. The module will include information on how microbes are classified, and how the different types of microbes are distinguished. We will discuss bacterial growth and differentiation, including genetic regulation. The module will explain the importance of microorganisms in health and disease, including human welfare issues such as opportunistic infections and the role of microorganisms in cancer. We will also consider how microorganisms can be used in research. This module is an essential prerequisite for the third year module BS3510 Molecular and Medical Microbiology.

Value - 15 credits
Suitable - 2nd year
Available - 2nd term
On - Tuesday
Prerequisites - BS1070

BS2010 - Invertebrate Biology: Structure, Behaviour and Evolution - Prof M J F Brown
The module involves a broad and in-depth study of the invertebrate phyla. The main focus will be on understanding body-plans, how structure relates to behaviour, and evolutionary relationships. The module will also examine invertebrate diversity and ecological importance. The practicals are an integral part of the module, and are designed to introduce techniques relevant to the study of invertebrates. These include experiments, dissection, microscopy, and preparation of whole mounts and staining sections for microscopical study.

Value - 15 credits
Suitable - 2nd year
Available - 1st term
On - Thursday
Prerequisites - None
BS2020 - Plant Life: From Genes to Environment - Dr E López-Juez
The module examines primarily the most advanced (flowering) plants, their evolution, developmental and functional biology. In part one, the origin and diversification of flowering plants is discussed, as it is reflected in their reproductive biology. In the second part the ‘building’ of a plant is analysed, with reference to the meristems, pools of ‘stem cells’ in which it primarily takes place. Part three reviews mechanisms by which the photosynthetic apparatus adapts to current light conditions or to water/CO₂ availability. Part four examines some case studies of the role and mode of action of plant hormones. Part five reviews plant environmental sensors of abiotic and biotic factors, key to adapt plant development and behaviour to the prevailing conditions. The mode of action of such sensors, and the responses that they evoke, are discussed. Part six touches upon plants in the context of their domestication (“accelerated evolution”) in the hands of humans and in relation to global environmental change, the impact it has on plants and of the role plants can play in reducing it.

Value - 15 credits
Suitable - 2nd year
Available - 2nd term
On - Monday
Prerequisites - BS1070

BS2040 - Cell Dynamics: Division and Movement - Prof L Bögre
The module will focus on the following key areas of modern cell biology: cell cycle, cell growth and differentiation, apoptosis, cell senescence, cell polarity, cell shape and cell motility, organelle origin and functions. Will give theoretical knowledge in modern cell biology methods, including microscopy and live cell imaging. Will introduce basic concepts on evolutionary constraints in cellular functions and links between cellular functions and development.

Value - 15 credits
Suitable - 2nd year
Available - 2nd term
On - Tuesday
Prerequisites - BS1060

BS2050 - Human Physiology in Health and Disease - Dr J Beauchamp
The module will focus on the functions and integration of selected human physiological systems and how these are disrupted by disease. The endocrine system: The thyroid gland will be used to explain the role of the hypothalamo-pituitary axis, feedback loops and multi-system response; the stress response to illustrate endocrine and nervous system integration in long- and short-term physiological response. How hormonal and neural signals integrate to regulate gastrointestinal activity, secretion and transit to ensure efficient digestion, and then to maintain blood glucose homeostasis in the absorptive and postabsorptive states will be discussed.
Skeletal muscle: The specialised structure of the skeletal muscle cell and the molecular basis of contraction will be discussed, including excitation-contraction coupling, the role of Ca²⁺, cross-bridge cycling, tetanic
contraction and fibre types. Aspects of nerve/muscle communication including the neuromuscular junction, Golgi tendon organs and spindles will be covered, together with the significance of motor units and recruitment for whole muscle function.

**Cardiovascular system:** The structure and function of cardiac muscle will be covered together with aspects of cardiovascular physiology including cardiac output and the control of arterial pressure, together with cardiac failure, arrhythmia and cardiomyopathy. The composition of blood will be discussed, including examples of blood disorders along with the haemostatic mechanisms that prevent blood loss following vessel damage.

**The respiratory system:** This topic will include respiratory surfaces and surfactant, the mechanics of respiration and gas exchange and the integration of respiration and cardiovascular output.

**Value**
- 15 credits

**Suitable**
- 2nd year

**Available**
- 1st term

**On**
- Monday

**Prerequisites**
- BS1060

**BS2060 - Developmental Biology - Dr E López-Juez**
Multicellularity has allowed living things to achieve levels of complexity and sophistication impossible at the single cell level. This module will explore the mechanisms by which zygotes establish or make use of basic body plan axes, and how subsequent cellular differentiation and interaction is achieved and results in the variety of tissues and organs that build an animal body. The module will focus on model organisms in which both embryological and genetic approaches have been developed, and will explore axis establishment, segmentation, cellular differentiation, organ development, and the widely-shared signalling pathways that underpin them.

**Value**
- 15 credits

**Suitable**
- 2nd year

**Available**
- 1st Term

**On**
- Tuesday

**Prerequisites**
- BS1060

**BS2090 - Insects, Plants and Fungi: Ecology and Applications - Prof A C Gange**
The module will cover the effects of herbivorous insects on plants and the ways in which plants defend themselves against attack. Beneficial effects such as pollination will also be addressed. The ecology of fungi pathogenic on insects and plants will be covered as well as fungi that are beneficial to plants (endophytes and mycorrhizas).

**Value**
- 15 credits

**Suitable**
- 2nd year

**Available**
- 2nd term

**On**
- Thursday

**Prerequisites**
- None
BS2110 – Practical Field Ecology – Dr J Koricheva
The module covers the design and analysis of ecological experiments, including field sampling techniques. Emphasis will be placed on the difficulties of designing experiments in the field, compared to controlled conditions. Building on first year modules, it will provide an opportunity to design and perform simple investigations into several different taxonomic groups such as mammals, invertebrates and plants. The practical work aims to teach skills such as identification using keys, field sampling, quantitative population estimation and the analysis of diversity. The module will run as a continuous daily field course, over a total period of ten days, in the second half of May (i.e. after the first year examinations). It will take place on and around the College campus, with some daily excursions. Exam will take place in week 1 of the autumn term.

Value - 15 credits
Suitable - 2nd year
Available - 3rd term of Year 1
On - 10 days in May 2017, after the examinations
Prerequisites - BS1050

BS2120 – Biological Data Analysis and Interpretation – Dr S Papworth
This module provides an introduction to the use of statistical methods in biological sciences. Emphasis is placed on understanding how questions in biology can be answered quantitatively using statistics. The most important and widely used descriptive, associative and comparative statistical tests are illustrated, especially how and when they can be used. Key concepts of statistical sampling and experimental design in biology are introduced. Exercises give students hands-on experience of using statistical techniques.

Value - 15 credits
Suitable - 2nd year
Available - 1st term
On - Wednesday
Prerequisites - None

BS2140 – Animal Behaviour – Dr S Portugal
The module demonstrates the great variety of animal behaviour occurring across the range of animal taxa and in different ecological situations. The module outlines the major theories that seek to explain animal behaviour, such as kin selection, cooperation and altruism. In depth case studies will be used to illustrate the advantages of the main methods used to study animal behaviour, and how they can be applied to studying different types of behavioural questions.

Value - 15 credits
Suitable - 2nd year
Available - 2nd term
On - Friday
Prerequisites - None
BS2150 – Applications of Molecular Genetics in Biology – Dr W Lucchesi
This module outlines the molecular tools currently available for the exploration of genetic diversity in a range of organisms, and for the genetic manipulation of micro-organisms, plants, and animals, and describes how genetically modified, transgenic organisms can be produced by a variety of transformation methodologies. Examples of the application of molecular genetic strategies in basic biological and biomedical research and in areas as diverse as crop improvement, pest management, vaccine development, microbial evolution, human inherited disease and cancer are presented and discussed.

Value - 15 credits  
Suitable - 2nd year  
Available - 1st term  
On - Friday  
Prerequisites - BS1070

BS2160 – Evolution - Dr F Ubeda de Torres
Evolution is the study of how the genotypic and phenotypic compositions of populations change through time. This module covers the foundation of evolutionary biology and the mechanisms that have shaped organisms since life began. How the evolutionary synthesis came to be; the origin of variation; the allelic composition of a population and how different processes, including natural selection, modify this composition; and adaptation. These topics lead to considering how we can study evolution using phylogenetic methods. Finally, we consider the mechanisms of speciation and the special topic of human evolution.

Value - 15 credits  
Suitable - 2nd year  
Available - 1st term  
On - Tuesday  
Prerequisites - None

BS2001X – Marine Biology – Dr D Morritt
The module exposes students, first-hand, to the broadest possible range of marine taxa, especially invertebrates, but including vertebrates and algae, sampled alive from their natural habitats. Practical work includes intertidal sampling (rocky shores and sandy shores) and sampling from a research vessel (plankton and subtidal benthos). On site lectures underpin the practical sessions and the module considers behavioural, ecological and physiological aspects, morphological adaptations, systematic relationships and also the economic significance of selected groups. Students acquire skills in identification and the presentation of written work. Group project work will develop interpersonal skills, including organisation, leadership and oral presentation. The inclusion of an element of self-assessment will further foster critical abilities. Students are expected to cover their travel and accommodation costs (likely to be around £350, although costs are still to be confirmed).

Value - 15 credits
Suitable - 2nd year
Available - Late summer vacation between years 2 & 3 (counts as year 2 module). Module details subject to confirmation.
Prerequisites - BS2010

BS2510 - Bioenergetics, Biosynthesis and Metabolic Regulation - Dr J McEvoy
Basic bioenergetics and respiratory electron transport, including concepts of oxidative phosphorylation and chemiosmotic theory; proton-translocating ATPase; structure and function of the respiratory chain. Biosynthetic pathways and their regulation, covering sugar nucleotides, storage polysaccharides, amino sugars and glycoproteins; the regulation of carbohydrate metabolism (including caloric homeostasis); the distribution and biosynthesis of isoprenoids, cholesterol, lipids and fat-soluble vitamins; protein prenylation and glycosylation.
Value - 15 credits
Suitable - 2nd year
Available - 1st and 2nd terms
On - 1st term; Thursday, 2nd term; Wednesday
Prerequisites - BS1090

BS2520 - Protein Structure and Function - Dr M Soloviev
The module covers the principles of protein structure, including secondary structure, motifs and domains, and protein folding in vivo. Methods for separation, purification, detection, structural and functional analysis of proteins are considered. The module also covers protein-protein interactions, and the principles of protein engineering and design, as well as the mechanisms of enzyme catalysis and regulation, with specific examples. The practical class will provide experience in using fundamental techniques in protein separation and analysis such as SDS-PAGE and Western blotting. The coursework also involves the structure and function prediction of an unknown protein sequence using bioinformatics tools.
Value - 15 credits
Suitable - 2nd year
Available - 1st term
On - 1st term, Wednesday
Prerequisites - BS1090

BS2530 - Molecular Biology - Dr C Wilkinson
The module covers the physical and chemical structure of DNA, recombinant DNA technology, DNA replication, gene organisation and structure, RNA and protein synthesis. The laboratory experiments cover a range of molecular biology techniques based on the theme of gene characterisation. This module also includes sessions in numeracy for molecular biologists and statistical skills.
Value - 15 credits
Suitable - 2nd year
Available - 1st and 2nd term
On - Thursday and Friday
Prerequisites - BS1070 or BS1090
BS2540 – Molecular and Cellular Immunology – Dr W Lucchesi
This module examines the specific immune system at the molecular level, dealing with the structure and function of the soluble and cell surface proteins involved. Subjects include: the immune response and acquired immunity; antibody structure and function; antibody diversity and clonal selection; genetics of immunoglobulin expression; the complement system; antibody techniques; monoclonal antibodies hypersensitivity reactions (allergies); the activity of T cells; major histocompatibility complexes, their role in transplant rejection and non-self-recognition; and, HIV and AIDS.

Value - 15 credits
Suitable - 2nd or 3rd year
Available - 1st and 2nd term
On - 1st Term: Tuesday, 2nd Term: Wednesday
Prerequisites - BS1070

BS2550 – Neuronal and Cellular Signalling – Dr P Alifragis
This module covers the principles of signalling in the nervous system, including electrical signalling along neurons and synaptic transmission. Different types of neurotransmitters will be considered and their receptors and intracellular signal transduction pathways will be studied. We will study the role and action of Acetylcholine, GABA and glutamate. The role of voltage-gated and ligand-gated ion channels will be discussed, including the role of potassium and calcium ion channels. The second term of the module will focus on central cell signalling pathways. Lectures include an introduction to drug development from an industrial and research perspective. The module will also cover the basis of cell signalling, from the outside of the cell (membrane receptors) to key intracellular mechanisms. These will include kinase (and phosphatase) activity, the second messengers heterotrimeric G proteins and small GTPases, cAMP, calcium and two important families of inositol-containing compounds. Examples of disease-related signalling will be highlighted throughout. Finally the module will introduce a range of model systems for neuroscience research.

Value - 15 credits
Suitable - 2nd or 3rd year
Available - 1st and 2nd term
On - 1st term, Thursday; 2nd term, Friday
Prerequisites - BS1060 and BS1090

BS2560 – Pharmacology and Toxicology – Dr P E Chen
The module aims to explain the chemical, physiological and biochemical factors which influence the efficacy of drugs. Topics covered include: drug-receptor interactions and the principal methods for receptor identification and characterisation, routes of administration of drugs, physico-chemical and physiological aspects of drug absorption and distribution, pathways of drug metabolism and excretion, renal clearance and ultra-filtration, mechanism of action of the major classes of analgesic and anti-depressant drugs, principles of toxicology and the major mechanisms of free radical induced tissue
damage, pharmacology of the autonomic nervous system and the neuromuscular junction, general and local anaesthetic agents.

**Value**  
- 15 credits

**Suitable**  
- 2nd year

**Available**  
- 2nd term

**On**  
- Monday

**Prerequisites**  
- BS1030 and BS1060

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**BS2570 - Physical Biochemistry for Life Scientists - Dr M Soloviev**

The module aims to provide the theoretical basis and examples of applications of physical methods for the study of biological molecules. The module considers the behaviour of macromolecules in solution, electronic spectroscopy methods such as fluorescence, phosphorescence and circular dichroism, mass spectrometry and its application to studies of biological macromolecules; MS, MS-MS, quantitative MS, Surface Plasmon Resonance, interferometry, biocalorimetry, scanning force microscopy and an introduction to nanobiotechnology.

**Value**  
- 15 credits

**Suitable**  
- 2nd year

**Available**  
- 1st term

**On**  
- Monday

**Prerequisites**  
- BS1030
INFORMATION ABOUT THIRD YEAR MODULES

BS3010 - Individual Research Project - Prof M J F Brown
An individual wet or dry investigation, supervised by an appropriate member of staff, who will provide guidance both before starting and during the module of your work. The research will be carried out during the Summer (post-2nd year exams), Autumn and Spring terms. Students will attend a project training day after 2nd year exams. In addition, students are expected to attend the School Seminar Series (~15 1-hour seminars from external scientists), to gain a broader scientific context for the work and develop presentational skills, and 3rd year tutorials (5 x 1-hour sessions), which will enable them to maximise the value of the transferable skills gained from their project work and thus enhance their future career. The work is assessed by means of a report submitted either at the end of either the first or second term in the third year. Students will have been allocated to supervisors on the basis of the student’s expressed research preferences, their 2nd year exam results and staff availability, and then research topics will be decided in consultation between the student and staff concerned before commencement of the project. In some cases students may have designed their own research project. Students will present a word-processed report (not exceeding 8,000 words exclusive of references) that will contribute 75% of the mark. 15% will be a continuous assessment mark awarded for performance by the supervisor. They will also give a 15 minute oral presentation on their project that will contribute 10% of the mark. Oral presentations will be given in Reading Week of Term 2 (for students who handed in projects at the end of Term 1) or the week after 3rd year exams (for all others).

Value - 30 credits
Suitable - 3rd year
Available - Summer vacation after 2nd year and 1st term; or, 1st and 2nd term, 3rd year
Prerequisites - As specified for individual projects in the BS3010 Handbook

BS3020 - Special Study: Dissertation - Dr M Soloviev
A literature research project on a biological or biochemical topic of the student’s choice, acceptable to the School of Biological Sciences. The resulting word-processed and bound report should be at least 5,000 but not more than 7,500 words, with some 20-40 references and appropriate figures or diagrams. Students will exercise and develop their skills in critically evaluating the recent scientific literature on a topic of their choice. The exploration of the literature will enable them to see the manner in which scientific understanding is advanced by obtaining data that is used to generate and test hypotheses. The student, in preparing a detailed written report, is presented with an opportunity to improve their presentational skills. The student’s expert knowledge in the topic may be investigated in the form of a viva voce.

Value - 15 credits
Suitable - 3rd year
Available - 1st and 2nd term of 3rd year
Prerequisites - None, but subject choice must be appropriate to
BS3030 - Biology of Parasitic Diseases - Dr J Tovar-Torres
This module explores the principles of parasitism and the protective mechanisms employed by immuno-competent hosts to limit the spread of infection. It outlines the biological strategies used by a range of unicellular and multicellular organisms to colonise its host causing disease in human and non-human hosts. Case studies on the pathology and the cellular immunity elicited by various parasites are explored. The immune evasion strategies used by widely distributed human parasites to protect themselves from immune attack are also reviewed. The principles and prospects of anti-parasitic vaccination in the 21st century are presented and discussed.

Value - 15 credits
Suitable - 3rd year
Available - 1st term
On - Tuesday
Prerequisites - BS2005 or BS2150 or BS2530

BS3060 - Conservation Biology - Dr S Papworth
The module covers the biological basis of the great threats to biodiversity - habitat loss and fragmentation, intensive agriculture, over-harvesting and natural resource exploitation, alien species, disease and global climate change - and the approaches developed by conservation biologists to overcome these threats at local and global scales. The potential for subjectivity in conservation decision-making and the crucial importance of science-based conservation is stressed. Practical work is part of the assessment and involves writing an invasive species management plan.

Value - 15 credits
Suitable - 3rd year
Available - 2nd term
On - Friday
Prerequisites - BS1040

BS3090 - Entomology: Pure and Applied - Prof J Koricheva
The module aims to provide students with a sound understanding of insect biology, addressing aspects of their physiology and biology. Insects are the most numerous animals on the planet and the basic information will enable students to appreciate why this is so. Insects are of conservation importance and part of the module will focus on beneficial insects such as pollinators and saproyxlic (dead wood feeding) species and focus on the reasons for their decline. The module also aims to introduce students to practitioners in entomology, showcasing research at the School, CABI and Rothamsted Research. The final aim of the module is to improve students' communication skills. Students will improve their verbal skills through the making of a podcast and their written skills through the production of an information leaflet for the general public.

Value - 15 credits
Suitable - 3rd year
BS3110 - Mediterranean Conservation and Ecology Field Course - Prof M J F Brown
The module exposes students to the ecology of the Alentejo region of Portugal, and to the conservation threats presented by tourism, infrastructure development and agricultural change. This will involve conservation ecology in marine, aquatic and terrestrial ecosystems, with a focus on key species and habitats. Practical work includes (i) Ecological risk assessment for coastal ecosystems (ii) Invertebrate sampling in native cork forest (iii) Bird monitoring, (iv) River-based surveys for invasive crayfish and otters (v) Cetacean workshop (including marine surveys) (vi) Kayak-based surveys for aquatic infauna. On-site lectures underpin the practical sessions and the course considers behavioural, conservation, and ecological aspects, and the relationship of conservation to policy and local knowledge. Students acquire skills in identification, monitoring, research project development, oral presentations, and the presentation of written work. Group project work will develop interpersonal skills, including organisation, leadership and oral presentation. The inclusion of an element of self-assessment will further foster critical abilities. This module will involve a week-long trip to Portugal. Estimated costs for the module are ~ £550 per student. Students are expected to cover their travel costs.

Value - 15 credits, counts as Y3 module
Suitable - 3rd year
Available - 3rd term of Y2
On - Last week of May/first week of June, after Y2 exams
Prerequisites - Recommended: BS2110

BS3120 - Population and Community Ecology - Prof V Jansen
In this module the principles of population and community ecology are explained, using examples from animal and plant assemblages. It focuses on population growth, inter- and intra-specific competition, trophic relations and the factors which regulate populations. The ecological processes that contribute to community organisation, such as food web structure, body size, succession and natural disturbances are considered. The role of population and community ecology in the maintenance of biodiversity is emphasised. A proposal writing exercise and assignments, which will involve the use of computer simulations, are included.

Value - 15 credits
Suitable - 3rd year
Available - 1st term
On - Friday
Prerequisites - None

BS3160 - Behavioural Ecology - Dr R Riesch
The module demonstrates how the behaviour of animals can be explained in
an ecological and evolutionary framework. The emphasis is upon functional and evolutionary hypotheses and testing models that seek to explain how animals find and use key resources (such as food, breeding territories, mates).

**Value** - 15 credits

**Suitable** - 3rd year

**Available** - 2nd term

**On** - Thursday

**Prerequisites** - BS2140

**BS3180 - Marine Ecology and Biodiversity - Dr D Morritt**

The module will begin with a brief introduction to the marine environment and oceanography. Following on from this a number of topical subjects will be used to illustrate recent developments in the field of marine ecology. The biodiversity and biogeography in the marine environment will be illustrated with reference to selected habitats, namely coral reefs and the deep ocean. The biology of the deep ocean, in particular the biology of mid-water and hydrothermal vent communities, will include consideration of technological advances in deep ocean exploration. This theme will be developed further in lectures on tracking studies, behaviour and conservation of marine megafauna, e.g. sharks, sea birds and marine mammals. The topical issues of marine pollution (including plastics pollution), ocean acidification and global climate change will be considered with respect to effects on marine biodiversity. Topicality is also maintained during coursework: pairs of students prepare a poster based on a recently published paper from a highly rated marine biological journal.

**Value** - 15 credits

**Suitable** - 3rd year

**Available** - 2nd term

**On** - Wednesday

**Prerequisites** - Recommended: BS2001X

**BS3190 - Climate Change: Plants and the Environment - Dr A Devoto**

The module will give an advanced treatment of the effect of global climate change on the interaction between plants and the environment and will provide new opportunities to consider at various levels (ecological, physiological and molecular) the reaction of plants to environmental changes. Topics include a historical perspective on plants and humanity, microbial science and crop improvement.

**Value** - 15 credits

**Suitable** - 3rd Year

**Available** - 2nd Term

**On** - Tuesday

**Prerequisites** - BS1060

**BS3210 Evolutionary Ecology (of Vertebrates) - Dr R Riesch**

Building on material from BS2160 (Evolution), this course introduces a range of advanced and current topics in evolutionary ecology with a strong focus on studies using vertebrate systems. Evolutionary ecologists investigate the
interactions between and within species, and, for example, consider the evolutionary effects of competitors, mutualists, predators, prey and pathogens.

**Value** - 15 credits

**Suitable** - 3rd Year

**Prerequisites** - BS2160

**NOTE:** this module is currently under development but may be available from 2018-19

**BS3220 Extreme Animal Physiology – Dr S Portugal**

The course demonstrates how vertebrate animals perform major feats within their annual cycles, focusing on those species either living in extreme environments, or exhibiting extreme behaviours. In depth case studies will be used to illustrate how physiology, morphology and anatomy combine to allow survival in harsh environments, and make extreme behaviours possible. Each lecture will include detail on the techniques used to examine animal physiology.

**Value** - 15 credits

**Suitable** - 3rd Year

**Available** - tba - from 2018-19

**On** - tba

**Prerequisites** - BS2140

**NOTE:** this module is currently under development but may be available from 2018-19

**BS3230 Circadian Biology – Dr P Devlin**

The course will look at rhythms throughout biology: in microbes, plants and animals. It will look at the impact of the internal circadian clock on behaviour, physiology, environmental responses and its wider implications for fitness. It will look at how the clock interacts with environmental signals. How the clock can be set to the right time; how the clock can moderate environmental responses; or how the clock can allow measurement of daylength for the timing of annual events. The emphasis will be upon the study of the real experimental data that have led to our understanding of the regulation of biological processes by clock and of the mechanism by which it works. This will include an examination of the methodology and analytical approaches used by circadian biologists. A wide range of organisms will be covered here.

**Value** - 15 credits

**Suitable** - 3rd Year

**Available** - tba - from 2018-19

**On** - tba

**Prerequisites** - BS1070

**NOTE:** this module is currently under development but may be available from 2018-19

**BS3410 – Industrial Biotechnology- tba**

This course outlines the concept of sustainable development and how it forms the basis of the global bioeconomy. This will include the exploitation of multipurpose crops and plant based biomass through biorefining for the production of energy, bulk and fine/speciality chemicals as well as covering the significant contribution of microorganisms to the field. Emphasis will be put
on the latest synthetic and systems biology techniques underpinning industrial biotechnology. The bioethics associated with the implementation of these new technologies as well as the global issue of food security and the use of GM crops will be discussed.

- **Value**: 15 credits
- **Suitable**: 3rd Year
- **Available**: TBA - from 2018-19
- **On**: TBA
- **Prerequisites**: BS2005, BS2520, BS2530
- **NOTE**: This module is currently under development but may be available from 2018-19

**BS3510 - Molecular and Medical Microbiology - Dr S Dissanayake**

This module will present advanced topics in molecular microbiology with particular emphasis on bacteria and pathogenic eukaryotes. Topics include pathogen mechanisms for infection, the host immune response to infection, vaccine development, gastrointestinal health and disease, resistance to antibiotics, anti-parasite chemotherapy and the genetic and biochemical validation of parasite drug targets in the kinetoplastidae.

- **Value**: 15 credits
- **Suitable**: 3rd Year
- **Available**: 1st and 2nd terms
- **On**: 1st term: Thursday, 2nd term: Friday
- **Prerequisites**: BS1070, BS2005; plus BS2540 recommended

**BS3520 - Seed Biology: From Molecular & Conservation Biology to Industrial Applications - Prof G Leubner**

Plant seeds and fruits are of central importance to human existence as they constitute the beginning and the end of most food supply chains (food security and sustainability). They are the delivery systems of agricultural biotechnology and a cornerstone of ecosystem conservation (seed banking). Topics of the lectures include a solid introduction into the fundamental processes of seed development and food reserve deposition, germination and reserve mobilisation, as well as the utilisation of seeds for molecular pharming. The evolution of the seed habit and the biomolecular paleobotany of fossil seeds focus on the key advantages and diversity of seeds and fruits which evolved in interaction with climate change. The morphological diversity of seeds and fruits includes a one-day visit and practical at Kew’s Millennium Seed Bank. This is followed by the biophysics of seed dispersal and the developmental biomechanics of seed fibres and seed germination. Further topics include a deeper insight into the molecular mechanisms underlying seed dormancy, germination and persistence in the soil bank, and their environmental control including by abiotic and biotic stress factors. The module also covers technologies used by the seed industry to improve crop seed quality and the research in agricultural biotechnology of wheat of Rothamsted Research at Harpenden. The lecture is complemented by module work in small groups on selected topics from the actual literature which is presented at the "seed conference". Websites: 'The Seed Biology Place' - www.seedbiology.eu, 'Kew’s Millennium Seed Bank' - www.kew.org/science-conservation/save-a-seed-prosper/millenium-seed-bank/, 'Rothamsted Research' - www.rothamsted.ac.uk
Value  - 15 credits  
Suitable  - 3rd Year  
Available  - 1st Term  
On  - Tuesday  
Prerequisites  - BS2020 or BS2150

BS3530 - Applications of Advanced Molecular Biology Methods - Prof R Williams
Molecular biology research provides a key approach underpinning modern research that is employed in a wide range of systems including animal and plant models, as well as the simple social amoeba, Dictyostelium. This approach often employs the production and use of transgenic and knockout genetically modified organisms and the analysis of gene regulation and expression in response to the environment and in circadian rhythms. This module will describe these modern functional genomics studies, at an advance level, with particular reference to current research applications.

Value  - 15 credits  
Suitable  - 3rd year  
Available  - 1st and 2nd term  
On  - 1st term: Thursday, 2nd term: Tuesday  
Prerequisites  - BS2530

BS3540 - Cell and Molecular Biology of Cancer - Prof L Bögre
This module will cover selected topics in molecular cell biology relevant to cancer, including: cell-cell adhesion and signalling; stem cells. We cover the importance of the cytoskeleton, including microtubule structure and their functional roles for cell division, cell cycle and polarity, cell dynamics and diseases. Additional topics on cancer biology include oncogenes, tumour suppressor genes, caretaker genes and the signalling and regulatory pathways these are involved in. The module covers the cellular, tissue and developmental barriers that have to be broken for the development of cancer. These will include apoptosis, senescence, angiogenesis and metastases. The module will also include case studies and novel research avenues for diagnosis and the rational treatment of cancer.

Value  - 15 credits  
Suitable  - 3rd year  
Available  - 1st and 2nd term  
On  - 1st term: Tuesday, 2nd term: Monday  
Prerequisites  - BS1060

BS3560 - Functional Genomics, Proteomics and Bioinformatics - Dr A Devoto
The module will give an advanced treatment of structure-function relationships in proteins and of new opportunities for the use of genome-wide analyses in dissecting regulation in biological systems. Gene and protein networks will also be discussed. Topics include, post-genomic science; modes of specific recognition in mediating protein interactions; domains and functions; and, protein engineering. Students complete a guided introduction to bioinformatics resources. This assesses individual competencies and
practical skills as each student will have to analyze separate datasets and develop own conclusions on the function of a gene/protein within a network through the analysis of databases and literature.

**Value** - 15 credits

**Suitable** - 3rd year

**Available** - 1st and 2nd terms

**On** - 1st term, Monday; 2nd term, Wednesday

**Prerequisites** - BS2520

**BS3570 - Human Embryology and Endocrinology - Dr J Murdoch**

This module will cover select aspects in the development of human embryos and the function of particular endocrine systems. Topics covered in detail include early embryonic development, with formation of the three cell layers during gastrulation and the specification of anterior-posterior and left-right axes. The formation and patterning of the brain and spinal cord will be discussed, including the cellular and molecular processes involved. The effects of genetic and environmental insults in causing birth defects will be considered and the preventative action of folic acid treatment will be discussed. Techniques for deciphering the cause of birth defects will be considered, including the role of model organisms and the process of positional cloning. Other topics include the embryonic processes involved in craniofacial development and craniofacial defects. The development of the thyroid, parathyroid and adrenal glands will be covered, with detail on the synthesis, regulation and action of parathyroid and adrenocortical hormones. Sexual determination and differentiation will be discussed. Reproductive endocrinology will cover the regulation of reproductive function in males and females, including the hormonal changes associated with pregnancy. The processes of egg and sperm maturation and fertilization will be covered, leading us back to early preimplantation development. This module is three quarters Embryology.

**Value** - 15 credits

**Suitable** - 3rd year

**Available** - 1st and 2nd term

**On** - 1st term: Wednesday, 2nd term: Friday

**Prerequisites** - BS2050 or BS2060 or BS2550

**BS3580 - Cellular and Molecular Neuroscience - Dr P Alifragis**

This module covers brain development, function and disorders. We discuss the cellular and molecular mechanisms of brain development with particular reference to the cerebral cortex. We discuss in detail the synthesis, storage and release of neurotransmitters. We will review the molecular basis of learning and memory. We will also study the cellular and molecular basis of brain disorders, including neurodegenerative disorders, particularly Alzheimer’s disease, as well as epilepsy and bipolar disorder. The module also includes lectures from a clinician, on the cellular and molecular basis of neuroprotection in preterm babies and infants.

**Value** - 15 credits

**Suitable** - 3rd year
BS3590 - Molecular Basis of Inherited Disease - Dr R Yáñez
The module provides an introduction to the theory, technology, and clinical practice of human molecular genetics: the metabolic and molecular bases of human inherited disease, mapping disease genes, the human genome project, bioinformatics, clinical aspects of the biochemistry of inborn errors of metabolism, and therapeutic approaches. The module is taught in relation to a selected range of illustrative genetic disorders and inborn errors of metabolism such as muscular dystrophies, cystic fibrosis, haemophilia, lysosomal storage disorders, haemoglobinopathies, mitochondrial respiratory chain disorders, neurotransmitter synthesis disorders, lipoprotein diseases and primary immunodeficiencies. This module is taught primarily by external lecturers who are experts in the field.

Value - 15 credits
Suitable - 3rd year
Available - 1st term
On - Friday
Prerequisites - BS1070 and BS1090

BS3595 - Clinical Physiology and Medicine - Dr J Murdoch
This module is taught by clinicians from Ashford and St Peter’s Hospital, who are experts in their field and working at the patient interface. The module will therefore be taught from the clinical perspective, providing both background information on a topic but taking it through to consider common disorders, tools for diagnosis and medical treatments. The module will consider the clinical physiology of selected tissues, including smooth muscle, bone, cartilage and ligaments, and will set these tissues into context in terms of intestinal function, anorectal physiology, and the formation and function of bone and soft tissues. The lectures will consider some common diseases and disorders, including pelvic floor defects, complications of child birth and colon cancer. Clinical problems with bone and soft tissue will be discussed, including the effects of exercise, ageing and injury. Other topics include the physiological effects of shock; stroke; and, the processes involved in making an initial clinical assessment of a patient. This module will also discuss how to rigorously scientifically evaluate new interventions or treatments, and students will learn how to critically appraise treatment evaluation data.

Value - 15 credits
Suitable - 3rd year
Available - 2nd term
On - varies: Monday or Tuesday
Prerequisites - BS2050

BS3600 - Clinical Diagnosis of Disease - Prof P Sharma
The module will cover the clinical application of biochemistry and physiology. The chemical pathology of a range of physiological systems will be studied,
including stroke genetics, kidney, liver, heart, and thyroid. In addition clinical biochemical aspects of cancer diagnosis and infertility and rheumatology in medicine will be covered. Lectures will concern the rationale behind the analyses used in the biochemical investigation of disease and the clinical aspects of disorders affecting the various organs/systems. The lectures will be followed by tutorials based on individual clinical cases and their investigation. The course concludes with a site visit to a local hospital.

Value - 15 credits
Suitable - 3rd year
Available - 2nd term
On - Thursday
Prerequisites - Biomedical Sciences or Medical Biochemistry degree programmes only

Please note that module information is given as accurately as possible but is subject to change in the course of continual updating and review of modules.
1.7 Registration Process

Choice of modules: Brief information about modules taught in the School are given above, and in the Undergraduate Handbook. More detailed information will be given in the Module specification for each individual module; these can be found at: http://www.rhul.ac.uk/biologicalsciences/informationforcurrentstudents/courseunits/home.aspx

Students should be aware that there are College thresholds for the minimum number of students required for a module to be taught and some modules can only accommodate limited numbers. After preliminary registration, if a module is over-subscribed or under-subscribed students will be notified as soon as possible and an alternative selection can then be made. However, modules are only rarely undersubscribed.

Preliminary registration: In the second or third term, students must pre-register for the optional modules they intend to take the following academic year. Registration for mandatory modules is automatic. Pre-registration for suitable optional modules is done conveniently by email and full instructions are provided. Appropriate forms are completed and submitted as an attachment to SBSPre-registration@rhul.ac.uk.

Careful consideration to the requirements of individual Degree Programmes must be given (see summary tables above) before completing the appropriate forms. Students should consider modules which form coherent groups, and must check timetables for compatibility. Note that while every effort is made to avoid clashes, it is ultimately the student’s responsibility to check the timetabling allows particular module combinations. Precise timetables for the next academic year will only be available at the beginning of the year, but existing timetables can be taken as a guide for the set-up that is likely to apply for the following year. Guidance on selection of modules is available from Personal Advisors and the Academic Coordinators for Molecular and Organismal Bioscience.

Registration: Confirmation of module registration occurs at the beginning of the relevant academic session. It is imperative that students see their Personal Advisor at the appointed time; the official College ‘Module Entry Form’ signed by the student at that time constitutes the basis for examination entries. Please note that the School makes every effort to retain module timetabling but that there may be unavoidable changes to the timetable over the summer vacation. Students should therefore check the timetables again carefully at the beginning of the academic year.

1.8 Module registrations

You can only register for 120 credits in each academic year (this excludes modules which are being taken as an exam rest). While you have the option of changing modules early in an academic term subject to agreement from the
School, once you have submitted assessment for the module, you may not replace it with another either in that term or in a subsequent term (e.g. Spring term). Any modules that you wish to take on an extracurricular basis (that is, as extra and not counting towards your degree) must be identified at the start of the academic year or before any assessment has been completed for the module.

1.9 Change of Module Registration

Students wishing to change any element of their module registration, either to drop a module for another one, to delete a module or to register for an extra module, must see their Personal Advisor for this to be authorised. You may not normally join a module after it has been taught for more than two weeks. Your authorised change of module must be recorded in the School Teaching Office for examination entry amendment (please see the Faculty Administrator, Teaching, B504).

1.10 Change of Degree Programme

Students wishing to change their degree programme registration must:

a) see the appropriate Academic Coordinator to obtain approval.
b) obtain the necessary form from the Faculty Administrators which will have to be signed by the Director of Teaching.

It is usually possible to change degree programmes during or at the end of the first year of study where the first year is common to several programmes, but after the first year difficulties might arise because of the requirement to complete particular core module units for the award of each degree. Advice on changing degree programme should be obtained from your Personal Advisor in the first instance, or from the appropriate Academic Coordinator.