The following required support courses should be taken to satisfy the indicated GE Requirements to achieve the minimum units to degree listed at the top of this sheet.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>Foundations of Biology: Energy and Matter</td>
<td>3/2</td>
</tr>
<tr>
<td>Cycles and Flows &amp; Lab (B2, B3)</td>
<td>4</td>
</tr>
<tr>
<td>Human Sexuality (B5)</td>
<td>4</td>
</tr>
<tr>
<td>or Biology of Cancer (B5)</td>
<td>4</td>
</tr>
<tr>
<td>or Biology of the Brain (B5)</td>
<td>4</td>
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<tr>
<td>or Biodiversity Conservation (B5)</td>
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<tr>
<td>General Chemistry &amp; Lab (B1, B3)</td>
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</tr>
<tr>
<td>Freshman English II (A3)</td>
<td>4</td>
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<tr>
<td>Stretch Composition III (A2)</td>
<td>4</td>
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<tr>
<td>or Advanced Stretch Composition II (A2)</td>
<td>4</td>
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<tr>
<td>or First-Year Composition (A2)</td>
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<tr>
<td>Calculus for the Life Sciences (B4)</td>
<td>4</td>
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<tr>
<td>College Physics &amp; Lab</td>
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<tr>
<td>Health, Nutrition and the Integrated Being (E)</td>
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<tr>
<td>or General Psychology (E)</td>
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<tr>
<td>or Mind, Brain &amp; Behavior: Integrated View (E)</td>
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<tr>
<td>or Sci and Math: Freshmen Experience I (E)</td>
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<tr>
<td>and Sci and Math: Freshmen Experience II (E)</td>
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Total Units: 75

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Foundations of Biology: Reproduction and Development &amp; Lab</td>
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<tr>
<td>Biometrics &amp; Lab</td>
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<td>Horizons in Biotechnology</td>
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<td>Genetics</td>
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<td>Cell and Molecular Biology</td>
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<td>Internship in Biology</td>
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<tr>
<td>of Cooperative Education</td>
<td>(2)</td>
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<tr>
<td>Concepts of Molecular Biology</td>
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<tr>
<td>Molecular Biology Techniques &amp; Lab</td>
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<tr>
<td>Scientific Communication</td>
<td>1</td>
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<tr>
<td>General Chemistry &amp; Lab</td>
<td>3/1</td>
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<tr>
<td>General Chemistry &amp; Lab</td>
<td>3/1</td>
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<tr>
<td>Quantitative Analysis &amp; Lab</td>
<td>2/2</td>
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<tr>
<td>Organic Chemistry &amp; Lab</td>
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<td>Biochemistry &amp; Lab</td>
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<tr>
<td>Biochemistry &amp; Lab</td>
<td>3/1</td>
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<tr>
<td>Basic Microbiology &amp; Lab</td>
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Total Units: 41

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>American Institutions</td>
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<tr>
<td>American Cultural Perspectives Requirement</td>
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<tr>
<td>American Institutions</td>
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</tbody>
</table>

All persons who receive undergraduate degrees from Cal Poly Pomona must pass the Graduation Writing Test (GWT). The test must be taken by the quarter following completion of 120 units for undergraduates.
### UPPER DIVISION COURSE CLUSTERS

#### CLUSTER 1 - PHYSIOLOGY
- Developmental Biology: BIO 320/320L 4/1
- Biophysics: BIO 410/PHY 410 4
- Neuroscience: BIO 424 4
- Neuroanatomy: BIO 426/428L 4/1
- Cellular Physiology: BIO 431/431L 3/1
- Stem Cell Biology: BIO 465 3
- Stem Cell Biology Lab: BIO 465L 1
- Endocrinology: BIO 520/520L 3/1
- Plant Physiology: BOT 428/428L 4/1
- Plant Anatomy: BOT 435/435L 2/2
- Fundamentals of Physical Chemistry: CHM 301/301A 3/1
- Biomedical Instrumentation and Measurements: ECE 435L 3
- Histology: ZOO 422/422L 2/3
- Animal Physiology: ZOO 428/428L 4/1

#### CLUSTER 2 - MOLECULAR BIOLOGY AND GENETICS
- Biotechnology Applications in Animal Science: AVS 430/430L 3/1
- Developmental Biology: BIO 320/320L 4/1
- Human Genetics: BIO 403/403L 3/1
- Biophysics: BIO 410/PHY 410 4
- Advanced Genetics: BIO 421 4
- Population Genetics & Lab: BIO 445/445L 3/1
- Molecular Biology of Recombinant DNA: BIO 455/455L 2/2
- Bioinformatics: BIO 459/459L 3/2
- Computer-assisted Drug Design: BIO 463/463L 3/1
- Stem Cell Biology: BIO 465 3
- Stem Cell Biology Lab: BIO 465L 1
- Advanced Cell Biology**: BIO 535 4
- Molecular Biology of Development**: BIO 555 4
- Advanced Bacterial Physiology and Genetics**: BIO 560 4
- Animal Tissue Culture**: BIO 565/565L 2/2
- Transmission Electron Microscope Techniques**: BIO 577/577L 2/3
- Scanning Electron Microscope Techniques**: BIO 578/578L 2/3
- Plant Tissue Culture: BOT 456/456L 3/1
- Recombinant DNA Biochemistry: CHM 453 3
- Microbial Physiology and Lab: MIC 428/428L 4/1
- Plant Breeding: PLT 404/404L 3/1

#### CLUSTER 3 - MICROBIOLOGY AND PATHOLOGY
- Developmental Biology: BIO 320/320L 4/1
- Radiation Biology: BIO 431/431L 3/1
- Advanced Bacterial Physiology and Genetics**: BIO 560 4
- Cellular Immunity & Disease**: BIO 570/570L 3/1
- Applied Microbiology: MIC 310/310L 3/2
- Food Microbiology: MIC 320/320L 3/1
- General Epidemiology: MIC 330 4
- Medical Bacteriology: MIC 410/410L 3/2
- Immunology-Biotechnology: MIC 415/415L 3/2
- Medical Mycology: MIC 425/425L 3/2
- Microbial Physiology: MIC 428/428L 4/1
- General Virology: MIC 430/430L 3/2
- Hematology: MIC 444 3
- Hematology Lab: MIC 444L 1
- Immunohematology: MIC 445 3
- Immunohematology Lab: MIC 445L 1
- Histology: ZOO 422/422L 2/3
- Medical Parasitology: ZOO 425/425L 3/2

#### CLUSTER 4 - BIOCHEMISTRY AND MOLECULAR SEPARATION TECHNIQUES
- Elements of Physical Chemistry: CHM 304/304A 3/1
- Elements of Physical Chemistry: CHM 305 3
- The Chemist in Industry: CHM 340 4
- Spectroscopic Methods: CHM 342/342L 2/2
- Separation Methods: CHM 343/343L 2/2
- Bioanalytical Methods: CHM 344/344L 2/2
- Physical Chemistry: CHM 352/352L 1/2
- Biochemical Mechanisms**: CHM 417 4
- Organic Synthesis: CHM 422/422L 2/2
- Bioanalytical Chemistry: CHM 450 4
- Enzymology: CHM 451/451L 3/1
- Recombinant DNA Biochemistry: CHM 453 3
- Biochemical Mechanisms**: CHM 565 3
- and Biomedical Instrumentation & Measurements: ECE 435/435L 3/1

#### CLUSTER 5 - AGRICULTURE
- Animal Parasitology: AHS 302/302L 3/1
- Immunological Procedures in Animal Production: AVS 405/405L 3/1
- Mammalian Endocrinology: AVS 412 4
- Biotechnology Applications in Animal Science: AVS 430/430L 3/1
- Advanced Animal Breeding: AVS 432/432L 3/1
- Plant Physiology: BOT 428/428L 4/1
- Plant Anatomy: BOT 435/435L 2/2
- Plant Tissue Culture: BOT 456/456L 3/1
- Food and Agricultural Marketing Applications: ABM 405 4
- Food Safety and Current Issues: FST 325 4
- Food Chemistry: FST 420/420L 3/1
- Principles of HACCP: FST 430/430A 3/1
- Food Chemistry II: FST 426/426L 3/1
- Food Microbiology: MIC 320/320L 3/1
- Plant Breeding: PLT 404/404L 3/1
- Crop Diseases: PLT 421/421L 3/1
- Advanced Plant Propagation: PLT 422/422L 3/1
- Diseases of Ornamental: PLT 427/427L 3/1
- Soil Chemistry: PLT 431/431L 3/1
- Environmental Sustainable Agriculture: PLT 437/437L 3/1

#### CLUSTER 6 - BUSINESS
- Regulatory Affairs and Safety Assessment: BIO 405 4
- Management Information Systems: CIS 310 4
- Principles of Marketing Management: IBM 301 4
- Marketing Strategy: IBM 302 4
- Organizational Behavior: MHR 318 4
- Training and Development: MHR 405 4
- Advanced Organizational Behavior: MHR 438 4
- Operations Management: TOM 301 4

Up to 4 units of BIO 441 and/or BIO 461 and 2 units of BIO 462 may count towards core electives.

** 500-level courses. Conditions which must be met to use these for undergraduate units are: a total of no more than 13 units may be used for undergraduate credit, the student must have senior standing and at least a 2.75 upper-division GPA. A special petition must be filed to receive undergraduate credit for graduate courses.