

12998-134(16) Introductory Physics for Biological Sciences A (3l, 3p)

2015

Course summary:

Selected topics, relevant to the biological sciences, from introductory mechanics, hydro-statics and optics.

Continuous assessment

C Mathematics (Bio) 124 or C Mathematics 114

Outcomes of course:

The student will be:

- able to correctly use the terminology associated with the subject.
- equipped with problem-solving skills that can be applied within the subject.
- able to integrate concepts thereby making the topic relevant and applicable.
- given the opportunity to develop his/her writing, language and communication skills.
- able to perform plausible experiments.
- able to apply the scientific method to obtain data, which can be analyzed mathematically.

Lecturers:

Dr JJ van Zyl (Eng)

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Dr A Stander (Afr)

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Course content:

1. Introduction and definitions. (Giancoli Chapter 1)

- The nature of physics
- Physics and its relation to other fields
- Models, theories, and laws
- Measurement and uncertainty: Significant figures
- Units
- Converting units
- Order of magnitude

2. Kinematics in one dimension. (Giancoli Chapter 2)

- Average velocity
- Instantaneous velocity
- Acceleration
- Falling objects

3. Dynamics. (Giancoli Chapter 4)

- Force
- Newton's first law
- Mass

- Newton's second law
- Newton's third law
- Weight and the normal force
- Solving problems with Newton's laws
- Problems involving friction, inclines
- Problem solving

4. Circular motion. (Giancoli Chapter 5)

- Kinematics of uniform circular motion
- Dynamics of uniform circular motion
- Newton's law of universal gravitation

5. Work and energy. (Giancoli Chapter 6)

- Work done by a constant force
- Work done by a varying force
- Kinetic energy and the work-energy principle
- Potential energy
- Conservative forces and non-conservative forces
- Mechanical energy and its conservation
- Problem solving
- Conservation of energy
- Energy conservation with dissipative forces
- Power

6. Linear momentum. (Giancoli Chapter 7)

- Momentum and its relation to force
- Conservation of momentum
- Collisions and impulse
- Conservation of energy and momentum in collisions
- Elastic collision in one dimension
- Inelastic collisions

7. Rotation. (Giancoli Chapter 8)

- Torque

8. Equilibrium. (Giancoli Chapter 9)

- The conditions for equilibrium
- Solving static problems
- Applications to muscles and joints

9. Fluids. (Giancoli Chapter 10)

- Density
- Pressure in fluids
- Atmospheric pressure and gauge pressure
- Pascal's principle
- Measurement of pressure
- Archimedes' principle
- Fluids in motion: Flow rate and the equation of continuity
- Bernoulli's equation
- Applications of Bernoulli's principle

18. Geometric optics. (Giancoli Chapter 23)

- The ray model of light
- Reflection: image formation by a plane mirror
- Reflection: images by spherical mirrors
- Index of refraction

- Refraction: Snell's law
- Total internal reflection
- Thin lenses: ray-tracing
- The thin lens equation and magnification
- Combinations of lenses.

19. Optical instruments. (Giancoli Chapter 25)

- The human eye: corrective lenses
- Compound microscope

Practicals (Tutorials):

The practical part of the course consists of three experiments. Self-study is an important part of the practical. Material regarding the practicals is available electronically, which gives students the opportunity to familiarize themselves with the apparatus beforehand. Practical and tutorial schedules will be handed out in class and will be available on SUNLearn at the start of the semester.

Study material:

Handbook: **Physics - Giancoli - 6th edition - Prentice Hall**
Software that is available via the intranet and on CD.

Learning opportunities:

1. Tutorials
2. Software that is available on the intranet to assist students with their problem solving techniques.
3. Test and practice examples (with feedback) are available on the intranet to enable students to assess their understanding of the subject.

Lecture Hall, Room number, Level

[Lecture halls available on MyMaties](#)

All practicals and tutorials are in the **Merensky Building** for Physics. The practical and Tutorial schedule and venues will be handed out at the beginning of the year, and made available on the module page on SUNLearn.

Assessment:

Methods of Assessment

Class tests
Tutorial tests
Practical reports and practical tests

Venue and time of assessment opportunities

[Class test schedule available on MyMaties.](#)

Calculation of final mark for the module:

Class tests: 60%
Tutorial tests: 25%
Practicals: 15%