1. COURSE NAME & CREDIT LOAD
COURSE CODE: NTD 205
COURSE TITLE: Human Physiology
NUMBER OF CREDITS: 3 Credits/Compulsory
COURSE DURATION: three hours per week for 15 weeks
As taught in 2010/11 Session

Courseware developed by Clara R. B. Oguntona
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Consultation Hours: 12 noon – 2 pm, Tuesdays and Thursdays

2. LECTURER DETAILS
As above

3. COURSE DETAILS

3.1 Human Physiology
Basic knowledge of the functioning of the normal human body. This is prerequisite to an understanding of the role of nutrients in normal individuals. It is also basic to the study of child development and family studies. Examples of abnormal functioning are given to understand normal functioning.

3.2 Course Content

3.3 Course Justification
Human Physiology attempts to explain the specific characteristics and mechanisms of the human body that makes it a living being. The very fact that humans remain alive is beyond self control, for hunger determines the seeking of food and fear makes humans look for refuge and so on. Thus the human being is actually an automaton. These special attributes permit humans to exist under widely varying conditions that otherwise would make life impossible.

3.4 Course Objectives
The general objective of the course is to enable students acquire the basic knowledge in the functioning of the normal human body. This is basic to the understanding of the functioning of the various organs and systems of the body which allows a proper study of Nutrition and courses like Growth and Development of the Young Child.
At the end of the course students would be able to
- Understand the principles that regulate the movement of molecules across membranes
- Follow the path of food components through the digestive system
- Understand how the cell obtains the energy to perform its functions
- Explain the functioning of the circulatory system
- Have a good grasp of the transport of Oxygen and CO₂
- Discuss the formation of urine and the functioning of the kidney
- Understand the role of hormones
- Have a basic knowledge of the physiology of pregnancy

3.5 Course Requirements
Students are expected to attend 70% of course activities to qualify to write the final exam. There will be two continuous assessment tests. The students are also encouraged to study the human body model and three classes (3 hours) would be devoted to this activity.

3.6 Grading Method

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SCORE (%)</th>
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<tbody>
<tr>
<td>Attendance to classes</td>
<td>3</td>
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<tr>
<td>Attendance to lab practicals</td>
<td>3</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; CAT</td>
<td>12</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; CAT</td>
<td>12</td>
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<tr>
<td>Final Exam</td>
<td>70</td>
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<tr>
<td>Total</td>
<td>100</td>
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3.7 Course Delivery Strategies
The course objectives will be delivered through the traditional face to face weekly lecture on the designed topics. The previous lecture would be summarized on consecutive lectures. There would be tutorials with the help of the human body model in the Nutrition Laboratory. Whenever possible IT material would be used to illustrate the lectures. Two Cat tests would be conducted and attendance recorded.

4.0 Lecture Content
**Week 1.** The role of water in the body. Properties and movement
**Objective:** Students will have a good grasp of the role of water in the body.
**Description:**
**Study Questions:**
1. How much water is there in the Intracellular fluid?
2. Discuss filtration power and osmotic pressure in the movement of water
3. Why is water such a special molecule?
4. Compare water characteristics with such of similar molecules
5. Explain how a red blood cell will behave when submerged in solutions of different concentrations
Reading List:

Week 2: Maintenance of electrolyte balance. Electrolyte composition of body fluids Acid-balance control. The digestive system: introduction
Objective: students will grasp important physiological concepts as stated above
Description:
3rd Hour: Laboratory introduction of model, location of organs of the digestive system

Study Questions:
1. Where is potassium reabsorbed in the kidney?
2. Discuss the role of aldosterone in the kidney
3. What is the most important characteristic of the reabsorption of Ca++ in the kidney?
4. What is the pH of the Extracellular fluid? How did you arrive at this figure?
5. It is said that digestion starts in the mouth, explain why?

Reading List:

Week 3: Organs of the digestive system and their functions in digestion
Objective: To understand the function and working of the different organs that constitutes the digestive system
Description:
3rd hour: Laboratory study of model and tutorial.
**Study Questions:**
1. How is the food stopped from entering the trachea?
2. Describe the wall of the esophagus
3. What is peristalsis?
4. What is the function of the HCl acid secreted in the stomach?
5. Describe the secretions taking place in the stomach

**Reading List**
1. [http://biology.clc.vc.edu/courses/bio105/digestiv.htm](http://biology.clc.vc.edu/courses/bio105/digestiv.htm)

**Week 4: The digestive system continues**
**Objectives:** the same as in week 3 plus to get a good grasp of the digestion and absorption of nutrients.
**Description:**
3. **3rd Hour:** CD on the structure and functioning of the digestive system. Tutorial.

**Study Questions:**
1. Explain the factors that affect absorption of nutrients such as vitamin B₁₂, iron, glucose, etc.
2. The small intestine has three segments, which are these and what are the functions of each segment?
3. Is fibre an essential in the diet?
4. Discuss the functions of the bile
5. How is the liver involved in detoxification?

**Reading List:**

**Week 5: The Circulatory System. Blood and its functions.**
**Objective:** To understand the role of the blood cells in the transport of oxygen, nutrients and wastes, coagulation and defense.
**Description:**
Other constituents of plasma.
3rd Hour: Laboratory identification of organs of the circulatory system and tutorial.

Study Questions:
1. Which are the normal blood volumes for women and men?
2. Where are blood cells produced?
3. How does the shape of RBCs help its function?
4. Explain the functions of the different plasma proteins
5. Which of the white blood cells have phagocytic properties?

Reading List:

Week 6: Blood Plasma. Circulation
Objective: To acquire knowledge about the role of plasma proteins. To understand the role of the heart in circulation and understand what blood pressure is and how it is generated
3rd Hour: The cardiac impulse. Normal ECG. Blood pressure.

Study Questions:
1. Discuss the functions of albumins and globulins
2. Which is the largest chamber in the heart?
3. How is the blood stopped of going back?
4. What is the normal cardiac output in an athlete?
5. Which are the only arteries carrying deoxygenated blood?

Reading List:
http://www.fi.edu/learn/heart
http://www.pbs.org/wgbh/nova/body/map-human

Objectives: Students would be conversant on the regulation of blood pressure. The interchange between blood and tissue fluid would help to understand some of the nutrition problems due to deficiencies.
3rd Hour: Revision.
Study Questions:
1. What is the pressure inside the right ventricle during systole?
2. What is responsible of the colloidal osmotic pressure?
3. Where does the lymphatic system joins the systemic circulation?
4. What are the differences and similarities between veins and arteries?
5. Which are the forces responsible for the blood return to the heart?

Reading List:
http://www.fi.edu/learn/heart/vessels/vessels.html
http://www.innerbody.com/image/card05.html
http://anatowiki.wetpaint.com/page/Lymphatic+system

8th Week: CAT
This is conducted with the class divided in 5 or 6 groups given the number of students usually enrolled for the course. It is done with a multiple choice type of test, and each group gets a different set of questions.

Week 9. Transport of Respiratory Gases. Haemoglobins. Factors affecting transport of gases. Objectives: Students would understand how oxygen is supplied to the tissues and the factors that affect this process.

2nd Hour: Abnormal haemoglobin variants. Talassemia major and minor. Sickle cell haemoglobin. Consequences. Carriage of CO₂
3rd Hour: Tutorial on the genetic bases of abnormal haemoglobins

Study Questions:
1. What state of oxidation does the iron have to be for Haemoglobin to transport oxygen?
2. How saturated with oxygen is haemoglobin in deoxygenated blood?
3. How does smoking affect the oxygenation of blood?
4. How does foetal haemoglobin differ from the normal adult one?
5. What is the difference between normal haemoglobin and sickle cell haemoglobin?

Reading List:
2. www.medicinenet.com/hemoglobin/article.htm

Objectives: to have a clear understanding of the functions of the kidney.


3rd Hour: Tutorial to discuss the mechanism of urine formation.

Study Questions
1. What is the main difference between afferent and efferent arterioles?
2. How many types of nephrons are there?
3. Desert animals are known to have one type of nephrons, which one?
4. How does ADH work? In which part of the nephrons?
5. What is the countercurrent mechanism?

Reading List:
http://www.nsbri.org/HumanPhysSpace/focus4/ep-urine.html


Objectives: Hormones are responsible for the control of different metabolic functions of the body, therefore an understanding of their mode of action is vital to understand the utilization of nutrients.


3rd Hour: Tutorial on the action of the different hormones.

Study Questions:
1. Explain the feedback mechanism of hormone release
2. Which hormones are produced in the Islets of Langerhams?
3. Which are the functions of thyroxine?
4. What hormone/s are said to be anabolic?
5. How is the secretion of insulin controlled?

Reading List:
http://www.endocrineweb.com

Objectives: Important knowledge to understand the role of nutrition during pregnancy, given that in countries like Nigeria, undernutrition is still a problem endangering the lives of future generations.


3rd Hour: Revision.

Study Questions:
1. What is the recommended weight gain for women with normal BMI at conception?
2. What is considered a normal haemoglobin value for pregnant women? Why?
3. What is the normal weight of the placenta at birth?
4. What is the recommendation for energy intake during pregnancy?
5. Is there a need to eat for two during pregnancy?

Reading List:

Week 13 Second CAT. As before students are divided in groups for this purpose.


1st Hour: Development of the organ systems. The circulatory system. The respiratory system. The gastrointestinal tract. The kidneys. Foetal metabolism.


3rd Hour: Tutorial

Study Questions:
1. How is the acidity of the infants' stomach comparing with that of an adult?
2. When is the myelinization of nerves completed?
3. When does the foetus produce urine?
4. What is the main source of energy for the foetus?
5. Does the new born have proteolytic enzymes?

Reading List:

Week 15 Revision Exercise

Objective: Students will revise all the topics covered with special reference to the Study Questions and CAT.
Study Questions:
Explain the importance of a large surface area to volume ratio in the red blood cells.
Why is the cardiac output higher in athletes?
Where are the semilunar valves?
Is there any opening between left and right sides of the heart?
How do you calculate filtration pressure at the venular end of the capillaries?
Which are the components of the Extracellular fluid compartment?
Discuss the role of ADH?
Name the buffers of physiological importance
What is the main function of leucocytes?
What happens to the red blood cells after 120 days?