



**Philadelphia University**  
**Faculty of Science**  
**Department of Basic Sciences and Mathematics**  
**First semester, 2008/2009**

**Course Syllabus**

<b>Course Title:</b> Topology	<b>Course code:</b> 250461
<b>Course Level:</b> 4	<b>Course prerequisite:</b> 250311
<b>Lecture Time:</b> 9:10 – 10:10	<b>Credit hours:</b> 3

**Academic Staff**

**Specifics**

<b>Name</b>	<b>Rank</b>	<b>Office Number and Location</b>	<b>Office Hours</b>	<b>E-mail Address</b>
<b>Dr. Anwar Al-Fawakhreh</b>	<b>Assistant Professor</b>	<b>2 - 1018 Faculty of Science</b>	<b>S. T. W. : 10:10 – 11:00 M. W. : 9:45 – 11:00</b>	<b>fawakhreh@yahoo.com</b>

<b>Module Coordinator</b>	Dr. Anwar Al-Fawakhreh
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**Course module description:**

This one-semester three-credit course in Topology will have three general interconnected objectives. First, as it has become increasingly apparent that topology is one of the major branches of modern mathematics, this course will provide a firm foundation in topology to enable the student to continue more advanced study in this area. Second, as several important areas of mathematics, in particular modern analysis, depend upon or are clarified by the certain topics in topology, this course will present and emphasize those topics in order to aid the student in his future mathematical studies. Finally, this course hopes to expose the students to both mathematical rigor and abstraction, giving there an opportunity further to develop his mathematical maturity.

Topology is the study of geometry wherein the notion of geometric equivalence, i.e. rigid translation, is replaced by continuous correspondence. For this reason, topology is often described as "rubber sheet geometry". As a mathematical discipline, topology is a fairly recent invention -- the first papers in the subject appeared in the late 19th century. Moreover, topology is a basic language requirement for virtually every area of advanced mathematics from algebra to dynamical systems and differential equations to theoretical physics.

This course will cover elementary topology: topological spaces; continuity and compactness; product spaces; separation properties; connectedness and path-connectedness; quotient spaces; and metric spaces.

**Course module objectives:**

1. Understand the concepts of topological spaces and apply them to different mathematical advanced Areas.
2. Learn and apply the concepts of topology on advanced courses
3. Analyze and synthesize proofs to build proofs in a deductive reasoning.
4. Understanding the concepts of compactness especially for the real numbers and applying the idea to different topological spaces.
5. Understanding the concepts of connectedness and applying them to many topological spaces.
6. Practicing proofs for many theorems on different ideas in topology to emphasis the right away in building proofs .
7. Improving the student's ability to think and write in a mature mathematical fashion and to a solid understanding of the material most useful for advanced courses.

**Course/ module components**

- **Text Book:** Benjamin T. Sims, Fundamentals of Topology, matics, 1976, Macmillan Publishing Co.

**Teaching methods:**

Lectures, discussion groups and tutorials.

**Learning outcomes:**

- Knowledge and understanding
  - Understanding the basic topics of Topology, such as: the concepts; topology, topological spaces, open sets, closed sets, closure, cluster points, compact and connected spaces.
  - Understanding the concepts of continuous functions and homoeomorphism. .
  - Defining some examples of topological spaces, such as: discrete, indiscrete, usual, co-finite, co-countable topologies and the Sorgenfrey line.
- Cognitive skills (thinking and analysis).
  - Analyze and synthesize proofs to build proofs of topological theorems in a deductive reasoning.
- Communication skills (personal and academic).
  - Thinking and talking logically through the principle of proving a big amount of theorems.
- Practical and subject specific skills (Transferable Skills).
  - Applying the concepts of topology to different mathematical advanced Areas.
  - Practice operations on topological spaces and decide whether the result forms a topology.

**Assessment instruments**

- First and second examinations
- Quizzes.
- Home works
- Final examination: 50 marks

<b>Allocation of Marks</b>		
<b>Assessment Instruments</b>	<b>Mark %</b>	<b>Date</b>
First examination	<b>20</b>	<b>Sunday 23/11/2008</b>
Second examination	<b>20</b>	<b>Sunday 21/12/2008</b>
Final examination	<b>50</b>	<b>TBA (18/1 – 27/1/ 2009)</b>
Quizzes, Home works and attendance	<b>10</b>	
Total	<b>100</b>	

### Documentation and academic honesty

- Documentation style (with illustrative examples)
- Smith, Eggen, and St. Andre, A Transition to Advanced Mathematics, 6<sup>th</sup> Edition 2006, Brooks Cole
- Protection by copyright
- Avoiding plagiarism.

### Course/module academic calendar

<b>Week</b>	<b>Subject</b>
1	<b>Ch 1. Introduction:</b> Historical notes, Fundamental Concepts, Review of logic, sets, relations and functions.
2	Cardinality, Review of the real line.
3	<b>Ch 2. Topological Spaces:</b> Definition and Some Examples, Bases, Subbases and local basis for a Topology.
4	Limit points and the derived set, Interior, Closure and Boundary of a set.
5	Continuous Functions and homeomorphisms. Topological properties.
6	Subspaces and Product Spaces. <b>First exam (Sunday 23 – 11 - 2008) at 9-10 am classroom 2-1004</b>
7	Separable spaces, First countable and second countable spaces.
8	<b>Ch 3. Separation Axioms:</b> $T_0$ spaces, $T_1$ Spaces, $T_2$ (Hausdorff) Spaces.
9	Regular ( $T_3$ ) Spaces and Normal ( $T_4$ ) Spaces.
10	<b>Ch4. Covering Properties:</b> Compact Spaces and Subspaces.
11	Compactness and Continuity, Locally Compact Spaces.
12	Other Covering Conditions (Lindelöf spaces and countably compact spaces ). <b>Second Exam (Sunday 21 – 12 - 2008) at 9-10 am classroom 2-1004</b>
13	<b>Ch 5. Connectivity Properties:</b> Connected and Disconnected Spaces, Characterizations of Connected spaces.
14	Applications of Connectedness (Intermediate Value Theorem and Fixed Point Theorem). . Locally Connected and Locally Path Connected Spaces.
15	<b>Ch 6. Metric Spaces:</b> Definition and Examples, Continuous Functions in Metric Spaces, Open Sets and Closed Sets in Metric Spaces
16	Review. <b>Final Exams will be held in the period (18/01/2009 – 27/01/2009) TBA</b>

**Expected workload:**

**On average students need to spend 2 hours of study and preparation for each 50-minute lecture/tutorial.**

**Some Notes:** To learn it is imperative for the student to take an active interest in their own education. To learn mathematics the student must read, think, and write in an analytical manner and this takes practice. Such practice is by working exercises. When troubles arise, and they will, the student must ask questions. A homework will be assigned each week from the text book; and it can be collected or graded by the instructor. Working the review exercises is an excellent way to review for the exams. Make-up exams will be offered for valid reasons only with consent of the Dean. Make-up exams may be different from regular exams in content and format.

**Attendance policy:**

Absence from lectures and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

**Module references (Books).**

1. Long, Paul E , AN INTRODUCTION TO GENERAL TOPOLOGY, Amman: Jordan Book Centre, 1986.
2. Seymour Lipschutz Kendall e. Atkinson, Theory and Problems of General Topology (Schaum's Outline Series), Schaum Publishing co., ISBN: **0-471-02985-8**
3. Munkres, James R., Topology, 2<sup>nd</sup> Edition (2000), Upper Saddle River, New Jersey: Prentice-Hall, 2000, ISBN: **0 – 13 – 178449 – 8**
4. Willard, Stephen, GENERAL TOPOLOGY, London: Adelson-Wesley, 1970.
5. Armstrong, M. A , BASIC TOPOLOGY , New York: Springer, 2003.

**Websites**

- <http://ecourse.philadelphia.edu.jo/login/index.php>

**Note: For more details please log in the Topology homepage through the E-course using the above address.**