Department of Mathematics and Computer Science
College of Science
University of the Philippines Baguio

SYLLABUS

A. COURSE DETAILS

Course Number:	Math 132	
Course Name:	Real Analysis	
Course Description:	Real number system; Lebesgue measure; measurable sets; measurable functions; integrals of simple and nonnegative measurable functions; Lebesgue integral; convergence theorems; differentiation and integration	
Credit Units:	3 units (Lecture)	
Prerequisite:	Math 55	
Requirements:	Three Long Examinations	60%
	Quizzes, Homework, Problem Sets, Reporting	20%
	Final Examination	20%
Passing Grade:	60%	

B. COURSE OUTCOMES

At the end of this course, the students must be able to

CO1: Demonstrate understanding of outer measure of a set by providing examples;

CO2: Identify if a given set or function is measurable;

CO3: Compare Riemann and Lebesgue integrals;

CO4: Understand the convergence theorems and their proofs, and apply them in evaluating Lebesgue integrals; and

CO5: Classify functions that are differentiable almost everywhere and compute their derivatives.

C. COURSE OUTLINE

Timeline	Course Outcome	Topics	Assessment Tools
Week 1-3	**CO1**	**Lebesgue Measure** • Outer Measure • Measurable Sets and Lebesgue Measure • A Non-measurable Set	**Boardwork Assignment Quiz**
Week 4-6	**CO2**	• Measurable Functions • Littlewood's Three Principle **First Long Examination**	**Boardwork Assignment Quiz Problem Set Exam**
Week 7-12	**CO3 CO4**	**The Lebesgue Integral** • The Riemann Integral • The Lebesgue Integral of a Bounded Function • The Lebesgue Integral of a Nonnegative Function • The General Lebesgue Integral **Second Long Examination**	**Boardwork Assignment Quiz Problem Set Exam**
Week 13-16	**CO5**	**Differentiation and Integration** • Differentiation of Monotone Functions • Functions of Bounded Variation • Differentiation of an Integral • Absolute Continuity • Convex Functions	**Boardwork Reporting Problem Set**
Week 17-18		**The Classical Banach Spaces** • The L^P Spaces • Minkowski and Holder Inequality	**Boardwork Reporting Problem Set Exam**
FINAL EXAMINATION *(as scheduled by the Office of the University Registrar)*			

D. REFERENCES

- H.L. Royden, *Real Analysis*, 3rd Ed. 1988
- H.L. Royden and P. Fitzpatrick, *Real Analysis*, 4th Ed. 2010
- J. McDonald and N. Weiss, *A Course in Real Analysis*, 2nd Ed. 2012
- G. Folland, *Real Analysis: Modern Techniques and Their Applications*, 2nd Ed. 1999
- R.G. Bartle, *Elements of Integration and Lebesgue Measure*, 1995
- S.B. Chae, *Lebesgue Integration*, 2nd Ed. 1995
- W. Rudin, *Real and Complex Analysis*, 3rd Ed. 1986
- W. Rudin, *Principles of Mathematical Analysis*, 3rd Ed. 1976

E. CLASS RULES

1. The University rule on class attendance (Article 346 of the University Code) shall be strictly enforced in the class.
2. If a student misses a short quiz, his/her grade in that quiz is zero. If a student misses a long exam for a valid reason (this requires documentation), his/her grade in the final exam will also account as his/her grade for the missed exam. This applies to no more than one long exam missed. A student who fails to take any examination for invalid reasons will get a grade of 0% for that exam.
3. Cheating, in any form, will not be tolerated.

F. RUBRIC FOR ASSESSMENT

A. Problem Set

CRITERIA

0	**Unacceptable**
1	**Poor**
2	**Basic**
3	**Acceptable**
4	**Exemplary**

Interpretation of the Problem

30% Incorrect interpretation of problem. A major misinterpretation of what is given or what is to be shown. There is at least some sign of relevant ideas regarding the problem. Correct but incomplete interpretation of the problem. May overlook significant details in the statement of the problem. Might be stated for indirect proof but a direct proof is given or vice-versa. Correct but with minor incorrect or unnecessary concepts for its solutions. Correct statement with the hypothesis (given) and conclusion (to show) clearly stated.

Correctness of Proof

70% Mainly incorrect consequences
Improperly deduced from the given. Little or no sense of how to prove the
result. Unconnected, mostly true statements properly deduced from the given. Listing facts without a sense of how to link them to get a correct proof. May just jump to the conclusion without justification. Statements linked into a reasonable (though perhaps misguided) attempt to prove the theorem. The proof may be left incomplete or may depend upon a major
Unjustified leap. A correct approach to proving the theorem is attempted. Some statements may be unjustified or improperly justified, but errors are minor and could be fixed without substantially changing the proof. A correct and complete proof is given. Some irrelevant information may be included, particularly on timed work where the student is unable to polish up the
presentation.

B. Reporting

Criteria Needs Improvement
1 Satisfactory
2 Good
3 Exemplary
4 Organization

10% Audience cannot understand presentation because there is no sequence of information. Audience has difficulty following presentation because student jumps around. Student presents information in logical sequence which audience can follow. Student presents information in logical, interesting sequence which audience can follow.

Content Knowledge

50% Students shows no understanding of mathematical concepts within the presentation Students are visibly uncomfortable with the mathematical concepts of the presentation Students are at ease with the mathematical concepts of the presentation but lack a deep conceptual understanding Students demonstrate a complete and comprehensive understanding of the mathematical concepts in the presentation

Visuals

10% Students use no visuals Students occasionally use visuals that rarely support the presentation and audience understanding Students use visuals that are related to the presentation but did not completely support audience understanding The visuals used supported audience understanding

Mechanics

10% Students presentation contained four or more spelling, grammatical or mathematical errors Presentation had three spelling, grammatical or mathematical errors Presentation had no more than two spelling, grammatical or mathematical errors Presentation had no spelling, grammatical or mathematical errors

Delivery

20% Student mumbles, incorrectly pronounces terms, and speaks too quietly for students in the back of class to hear. Student incorrectly pronounces terms. Audience members have difficulty hearing presentation. Student's voice is clear. Student pronounces most words correctly. Student used a clear voice and correct, precise pronunciation of terms.