



AYDIN ADNAN MENDERES UNIVERSITY COURSE INFORMATION FORM

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|--|-----|---|----------------------|---|---|--------------------------------|---|------------|---|
| Course Title | | Category Theory I | | | | | | | |
| Course Code | | MTK623 | | Course Level | | Third Cycle (Doctorate Degree) | | | |
| ECTS Credit | 7.5 | Workload | 188 (<i>Hours</i>) | Theory | 3 | Practice | 0 | Laboratory | 0 |
| Objectives of the Course | | This course aims to give students the basic concepts of category theory, to develop analytical thinking and understanding of abstract concepts. This course aims to gain a systematic approach to define problems and to solve the problems by the discussed topics and their applications. | | | | | | | |
| Course Content | | Categories, monomorphism, epimorphism, initial and terminal objects, functors, natural transformations, category of functors, limits in categories, equalizer, coequalizer, limits, colimits, limits in category of functors, universal transformations, adjoint functors. | | | | | | | |
| Work Placement | | N/A | | | | | | | |
| Planned Learning Activities and Teaching Methods | | | | Explanation (Presentation), Discussion, Individual Study, Problem Solving | | | | | |
| Name of Lecturer(s) | | | | | | | | | |

Assessment Methods and Criteria

| Method | Quantity | Percentage (%) |
|---------------------|----------|----------------|
| Midterm Examination | 1 | 25 |
| Final Examination | 1 | 60 |
| Assignment | 1 | 15 |

Recommended or Required Reading

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| 1 | MacLane, S. "Categories for the Working Mathematician", Springer-Verlag, 1971 |
| 2 | Herrlich, H. And Strecker, G. E. "Category Theory", Allyn and Bacon Inc., Boston |

| Week | Weekly Detailed Course Contents | |
|------|---------------------------------|---|
| 1 | Theoretical | Categories |
| 2 | Theoretical | Monomorphisms |
| 3 | Theoretical | Epimorphisms |
| 4 | Theoretical | Initial, Terminal and Zero Objects |
| 5 | Theoretical | Functors |
| 6 | Theoretical | Hom-Functors and Properties of Functors |
| 7 | Theoretical | Natural Transformations |
| 8 | Theoretical | Functor Categories |
| 9 | Intermediate Exam | MIDTERM EXAM |
| 10 | Theoretical | Limits in Categories |
| 11 | Theoretical | Limits and Colimits |
| 12 | Theoretical | Limits in Functor Categories |
| 13 | Theoretical | Universal Maps |
| 14 | Theoretical | Adjoint Functors |
| 15 | Final Exam | FINAL EXAM |

Workload Calculation

| Activity | Quantity | Preparation | Duration | Total Workload |
|---------------------------------------|----------|-------------|----------|----------------|
| Lecture - Theory | 14 | 3 | 3 | 84 |
| Assignment | 1 | 11 | 2 | 13 |
| Reading | 14 | 0 | 3 | 42 |
| Midterm Examination | 1 | 20 | 2 | 22 |
| Final Examination | 1 | 25 | 2 | 27 |
| Total Workload (Hours) | | | | 188 |
| [Total Workload (Hours) / 25*] = ECTS | | | | 7.5 |

*25 hour workload is accepted as 1 ECTS



Learning Outcomes

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|---|---|
| 1 | Be able to comprehend the basic concepts of category theory |
| 2 | Be able to comprehend abstract concepts |
| 3 | Be able to comprehend analytical thinking |
| 4 | To be able to gain the skill of interpreting some interrelations among these concepts |
| 5 | To be able to use mathematical concepts in solving certain types of problems |

Programme Outcomes (Mathematics Doctorate)

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|----|---|
| 1 | To be able to develop the current and advanced knowledge of mathematics domain to expertise level by an original idea or research, based on the level of its knowledge at the graduate level, and to be able to reach original definitions that will bring innovation to Mathematics. |
| 2 | To be able to comprehend the interdisciplinary interaction associated with Mathematics. |
| 3 | To be able to use and evaluate the new knowledge in the field of Mathematics with a systematic approach. |
| 4 | To be able to develop an idea, a method, a design or an application that will bring innovation to Mathematics, to use well known ideas, methods, designs or applications on a different research area, or to search, comprehend, design, adapt and apply an original subject matter. |
| 5 | To be able to criticize, analyze, synthesize and evaluate new and complex ideas. |
| 6 | To be able have high-level skills in research methods related to studies on Mathematics. |
| 7 | To be able to expand the frontiers knowledge in the field of Mathematics via generating or interpreting an original study, or publishing at least a scientific paper in national/international refereed journals. |
| 8 | To be capable of leadership in the positions that require the analyses of problems related to the field of Mathematics. |
| 9 | To be able to defend his/her original ideas among the experts in the discussion of math related issues, and to be able to communicate effectively to show his/her competence in the field of Mathematics. |
| 10 | To be able to contribute to the solution of the social, scientific, cultural and ethical problems related to the Mathematics, and to be able to support the development of social, scientific, cultural and ethical values. |
| 11 | To be able to have both oral and written communication using a foreign language. |

Contribution of Learning Outcomes to Programme Outcomes 1:Very Low, 2:Low, 3:Medium, 4:High, 5:Very High

| | L1 | L2 | L3 | L4 | L5 |
|-----|----|----|----|----|----|
| P1 | 4 | 4 | 4 | 4 | 4 |
| P2 | 3 | 4 | 4 | 4 | 4 |
| P3 | 4 | 5 | 5 | 4 | 4 |
| P4 | 3 | 4 | 4 | 4 | 4 |
| P5 | 4 | 4 | 4 | 4 | 4 |
| P6 | 3 | 4 | 4 | | |
| P7 | | 5 | 5 | | |
| P8 | | 4 | 4 | | |
| P9 | 3 | 4 | 4 | | |
| P10 | | 4 | 4 | | |

