**University of Management and Technology**

**Course Outline**

Course code: MTH 644 Course title: BCK-Algebra and applications

Course code: MTH 7\_\_\_\_ Course title: Theory of BCK-algebra

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| Program | MS/PhD |
| Credit Hours | 3 |
| Duration | One Semester |
| Prerequisites | NA |
| Resource Person | Dr. Agha Kashif, |
| Counseling Timing  (Room# ) |  |
| Contact | [kashif.khan@umt.edu.pk](mailto:kashif.khan@umt.edu.pk), |

**Chairman/Director signature………………………………….**

**Dean’s signature…………………………… Date………………………………………….**

**Course Description:**

This course introduces advanced concepts from the theory of lattices and BCK-algebra and discuss its applications in theories like fuzzy theory, soft set theory, module theory, coding theory, graph theory etc.

**Learning Objective:**

After successfully completing the course, students should be

1. able to understand the notion of BCK-algebra, BCI-algebra
2. able to understand the notion and properties of bounded BCK-algebra, implicative BCK-algebra, ideals in BCK-algebra
3. able to understand rings the notion of self-maps and self-regular maps in BCK-algebra
4. able to understand applications of BCK-algebra in areas like fuzzy theory, soft set theory, module theory, graph theory, coding theory etc.

**Learning Methodology**

**Grade Evaluation Criteria**

Following is the criteria for the distribution of marks to evaluate final grade in a semester.

**Marks Evaluation Marks in percentage**

Quizzes (3-4): 10

Assignments (3-4) 10

Mid Term (1) 25

Attendance & Class Participation 00

Term Project (1) 10

Presentations (1) 05

Final exam (1) 40

Total 100

**Recommended Text Books:**

Meng, J. and Jun, Y.B.: *BCK Algebras* (Kyung Moon Sa. Co., Seoul., 1994).

**Reference Books:**

1. Iseki, K. and Tanaka, S.: *An Introduction to the Theory of BCK Algebra*, Math. Japonica, 23, No.1(1978), 1-26.
2. Anton, H. and Rorres, C.: *Elementary Linear Algebra with Applications* (Wiley, 2005).
3. Anton, H..: *Elementary Linear Algebra* (Wiley, 2000).
4. Vivek, S. and Vikas, B.: *Algebra* (Narosa Publishing House, India, 2003).

**Calendar of Course contents to be covered during semester**

**Course code……MTH 6\_\_\_\_ Course title…BCK-algebra and its applications**

**Course code……MTH7\_\_\_\_ Course title…Theory of BCK-algebra………**

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| **Week** | **Course Contents** | **Reference Chapter(s)** |
| 1 | Relations, Partial order relations, Equivalence relations Examples and theorems |  |
| 2 | Lattices, Distributive lattices |  |
| 3 | Definition of BCK/BCI algebra. Examples. |  |
| 4 | General properties of BCK algebra. |  |
| 5 | Commutative BCK algebra. Examples and properties |  |
| 6 | Bounded, BCK-algebras Examples and properties |  |
| 7 | Ideal theory of BCK algebras. |  |
| 8 | Midterm exam |  |
| 9 | Definition, types and examples of ideals in BCK  algebra. |  |

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| 10 | Self maps of BCK algebra. Right and left self maps.  Left regular maps and their general properties |  |
| 11 | Kernels and annihilators in BCK-Algebras. |  |
| 12 | Applications of BCK-algebras:  BCK-modules,  BCK-homological algebra (for PhD only) |  |
| 13 | Applications of BCK-algebras:  Fuzzy BCK-algebras  Soft BCK-modules  Fuzzy Soft-BCK-modules |  |
| 14 | Applications of BCK-algebras:  Graphs associated with BCK-algebra  Hyper BCK-algebras and properties (for PhD only)  Codes based on BCK-algebra (for PhD only) |  |
| 15 | Codes Based on BCK-algebras  Graphs associated with BCK-algebras |  |