Theory and Application of Non-traditional Machining and Metal Forming Processes

2 units (selection)

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Target〉 The class introduces the principles, characteristics, and applications of representative methods of non-traditional machining. And then it introduces foundation of the numerical simulation by elastic and elasto-plastic finite element method and their application to metal forming processes.

Outline〉 In the former half of the class, non-traditional machining is discussed. Non-traditional machining has many kinds of methods which use a variety of principles. These methods are put in practical use and have their own particular merits and demerits. Therefore, to achieve efficient, desired machining, these methods must be suitably selected by taking shapes, dimensions, accuracy, surface quality, material, cost, environmental impact, and so on into consideration. To meet the requirements, the principles and characteristics of representative methods of non-traditional machining are introduced and the merits and demerits of them in applying them to machining of various metals are discussed. In the latter half of the class, metal forming processes are discussed. Although metal forming techniques are diverse, the primary objective is to produce a desired shape change. The major concerns of the engineer are the forces required for the operations and the properties of the work materials. Engineering plasticity and its application to metal forming processes are introduced.

Style〉 Lecture

Keyword〉 *Non-traditional Machining, finite element analysis*

Relational Lecture〉 "**Production and Manufacturing System**"(0.5)

Requirement〉 Students are required to have a good understanding of undergraduate-level mechanical engineering, physics, chemistry, and mathmatics.

Goal〉 To understand the principles and characteristics of representative methods of non-traditional machining and foundation of the numerical simulation by elastic and elasto-plastic finite element method

Schedule〉

1. Fundamentals of electrical discharge machining
2. Applications of electrical discharge Machining
3. Fundamentals of electrochemical machining
4. Applications of electrochemical machining
5. Laser beam machining
6. Electron beam machining and ion beam machining
7. Etching and ultrasonic machining
8. Exercise
9. Analysis principle of finite element method
10. Plane strain
11. Plane stress
12. Axial symmetry
13. Principle of virtual work
14. Triangle element
15. Quadrangle element
16. Plastic deformation

Evaluation Criteria〉 Assignments count 50% , exercises and examinations count 50%.

Textbook〉 Predistributed printed synopsises are also used.

Reference〉 To be introduced in the class.

Contents〉 http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216623

Student〉 Able to be taken by only specified class(es)

Contact〉

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