Course: Material Flow Analysis and Its Applications

Course ID: 70050362

**Instructor**: Prof. Xianlai Zeng, School of Environment

**Course Description**:

This course will address the theory and method system of material flow and present some cases in many relevant areas related to environmental protection, and waste & resource management. It consists of four parts: Introduction section presents the objective, scope, and application of MFA; Methodology section addresses the terms and definitions, procedures, and data uncertainties & evaluation; Case studies section demonstrates its applications in environmental management, resource conservation, and waste management; and the last section is outlook of MFA from vision to implications for circular economy.[[1]](#footnote-1)

The hidden agenda behind the course comprises two objectives: resource conservation and environmental protection, or “sustainable materials management”. We believe that anthropogenic activities should not destroy or damage natural resources and systems. Future generations must be able to enjoy resources and the environment as we do. We also believe that this goal can be achieved if technology and social sciences are developed further. The case studies presented in this course exemplify the potential of MFA to contribute to sustainable development of the environment and resource (or material).

**Assessment**

homework 20 %；final exam 50 %；program 20 %；attendance10%。

**Textbooks and Bibliography**:

**P. H. Brunner, H. Rechberger. *Handbook of Material Flow Analysis: For Environmental, Resource, and Waste Engineers* (Second Edition). CRC Press, 2017. ISBN: 978-1-498-72134-9.**

Course Schedule

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Week | Content | Format | Contact hours inside class | Contact hours outside class |
| 1 | **1. Introduction to MFA**  1.1 Objectives and Scope  1.2 What are MFA and SFA?  1.3 History of MFA | LEC | 2 | 2 |
| 2 | 1.4 Application of MFA  1.5 Objectives of MFA | LEC | 2 | 6 |
| 3 | **2. Framework Design of MFA**  2.1 MFA Terms and Their Definitions | LEC | 2 | 4 |
| 4 | 2.2 MFA Design Procedures | LEC | 2 | 4 |
| 5-6 | 2.3 Treatment of Data Uncertainties | LEC | 2 | 6 |
| 7 | 2.4 MFA with Software STAN | LEC | 2 | 6 |
| 8 | 2.5 Evaluation Methods for MFA Results | LEC | 2 | 4 |
| 9 | **3. MFA Applications**  3.1 Environmental Management | CAS | 2 | 4 |
| 10 | 3.2 Resource Conservation | CAS | 2 | 4 |
| 11 | 3.3 Waste Management | CAS | 2 | 4 |
| 12 | 3.4 Industrial Applications | CAS | 2 | 2 |
| 13 | 3.5 Regional Materials Management | CAS | 2 | 4 |
| 14-15 | 3.6 Typical Cases | SEM | 4 | 0 |
| 16 | **Summarization** | LEC、COL | 2 | 0 |
| **Total** |  |  | **32** | **52** |

注1：

学习成效：学生完成该门课程学习后所能达到的知识、能力或素质各方面的综合要求。

注2：

讲授(LEC)：LECTURE Instructor presentation of course materials. 由教师对课程内容进行讲述说明；实验(LAB)：LABORATORY Instructional experiences requiring special laboratory equipment and facilities；根据教学经验，要求提供特定的实验室设备和设施；实习(INT)：INTERNSHIP Individual activity in authentic non-academic setting arranged by instructor.由教师安排的非学术性独立活动；设计(PRO)： PROJECT，  A detailed study of a subject. 学生就某一主题的深入设计研究；临床实践(CLC) ：CLINIC Students learn skills by actual practice involving patients or clients.学生通过涉及患者的实际操作学习技能；田野调查(FLD)：FIELDWORK Instructional activity in non-classroom settings.在教室外进行的教学活动；学位论文(THO)：THESIS；研讨(SEM)： SEMINAR Student-instructor coverage of course materials.师生共同就课程内容进行讨论；案例教学(CAS)： CASE Instructional activity based on cases.基于案例进行教学活动；研讨会(COL)：COLLOQUIUM A seminar led by different instructors.由不同的教师主持的研讨会；习题课(SES)：SESSION Instructor presentation of course material, with further discussion.教师组织课程教学材料的深入讨论；个别辅导(TUT)：TUTORIAL Supplementary (or remedial) individualized instruction.补充性(或补救)的个性化辅导；基于网络或技术(WBL)：Web-based or technologically-mediated activities replacing standard lectures.基于网络或多媒体技术的教学活动取代标准的课程讲授

1. [↑](#footnote-ref-1)