

## Course Specification Template

### 1. General information about Instructor:

| Name                | Dr. Saed Khayat       |  |              | Class Time & Office Hours |      |      |      |     |
|---------------------|-----------------------|--|--------------|---------------------------|------|------|------|-----|
| Phone               | Internal              |  | Day          | SUN                       | MON  | TUE  | WED  | THU |
|                     | External              |  |              |                           |      |      |      |     |
| Mobile              | 0599868605            |  | Class Time   |                           | 3-4  | 11-2 | 3-4  |     |
| Instructor's E-mail | Saed.khayat@gmail.com |  | Class Room   |                           | E220 | Lab. | E220 |     |
|                     |                       |  | Office Hours |                           | 2-3  |      | 2-3  |     |

### 2. General information about the Course

| No | Requirements                                       |  |                                  |   |                                  |                                  |                                  |
|----|--|--|----------------------------------|---|----------------------------------|----------------------------------|----------------------------------|
| 1  | Course Title                                       | <b>Solid Waste Treatment</b>                             |                                  |   |                                  |                                  |                                  |
| 2  | Course code & Number                               |  |                                  |   |                                  |                                  |                                  |
| 3  | Credit hours                                       | Theo. (CH): 2  |                                  |   | Practical (CH):1                 |                                  |                                  |
| 4  | Faculty  | <b>Agricultural Sciences and Technology</b>              |                                  |   |                                  |                                  |                                  |
| 5  | Department / Division that offers the course:      | <b>Environment and Sustainable Agriculture</b>           |                                  |   |                                  |                                  |                                  |
| 6  | Course type  | Compulsory   |                                  |   | Elective                         |                                  |                                  |
|    |  | Uni.<br><input type="checkbox"/>                         | Fac.<br><input type="checkbox"/> | Dep.<br><input checked="" type="checkbox"/> | Uni.<br><input type="checkbox"/> | Fac.<br><input type="checkbox"/> | Dep.<br><input type="checkbox"/> |
| 7  | Level and Semester                                 | 3/1  |                                  |   |                                  |                                  |                                  |
| 8  | Prerequisite(s) – If any                           | <b>Chemistry 101/ Analytical Chemistry/ Microbiology</b> |                                  |   |                                  |                                  |                                  |
| 9  | Co-requisite(s) – if any                           |  |                                  |   |                                  |                                  |                                  |
| 10 | Program/programs for it/them the course is offered |  |                                  |   |                                  |                                  |                                  |
| 11 | Instruction Medium:                                | English <input checked="" type="checkbox"/>              |                                  |   | Arabic <input type="checkbox"/>  |                                  |                                  |

### 3. Course description:

In this course students will learn the fundamental principles and key technologies that are used to manage municipal, commercial, and industrial solid waste. Principles of solid and hazardous waste management; sources, types and composition of municipal solid waste, hazardous waste, infection waste, and radioactive waste; solid waste generation and prediction of solid waste quantity; storage, collection and transportation, waste transformation and treatment processes, recycling, remediation.

### 4. General Course Objectives

Broad overview of the discipline of solid waste management as a major issue of environmental management and basic tools for understanding various types of waste management policy.

**5. Intended Learning Outcomes/ILO's (please specify the learning outcomes of the course as outlined below):**

- When students complete this course, they will be able to:
1. Identify key sources, typical quantities generated, composition, and properties of solid and hazardous wastes;
  2. Identify waste disposal or transformation technics (landfills and incinerators);
  3. Recognize the relevant regulations that apply for facilities used for disposal, and destruction of waste;
  4. Conduct invasive and non-invasive site investigation and understand permitting process for constructing landfills;
  5. Identify and design Solid and Hazardous Waste Landfills (RCRA Subtitle D and C) including closure, post-closure, and rehab issues;
  6. Estimate typical waste disposal costs; and
  7. Identify recycling and reuse options (composting, source separation, and re-use of shredded tires, recycled glass, fly ash, etc.).

**6. Topics covered and Calendar:**

**A. Theoretical parts (Please state the titles of the subjects you intend to cover each week)**

| (Course schedule) |   |          |
|-------------------|---|----------|
| WEEK              | Topics to be discussed  | COMMENTS |
| <b>1-3</b>        | <b>INTRODUCTION</b><br>1.1 Overview<br>1.2 Historical perspective<br>1.3 Appropriate management system<br>1.4 The Solid Waste Management system   |          |
| <b>2-6</b>        | <b>2 . COMPOSITION, CHARACTERISTICS, QUANTITIES AND ENVIRONMENTAL EFFECTS</b><br>2.1 Introduction<br>2.2 Definitions and classification of solid wastes<br>2.3 Composition, characteristics and quantities<br>2.4 Health and Environmental Effects                          |          |
| <b>7</b>          | <b>EXAM 1</b>   |          |
| <b>8-10</b>       | .<br><b>3 WASTE STORAGE AND COLLECTION</b><br>3.1 Introduction<br>3.2 The Collection System<br>3.3 Containers and Collection Vehicles<br>3.4 The Collection Operation<br>3.5 Collection Crew Nehicle Interaction<br>3.6 Transfer Stations<br>3.7 Institutional arrangements |          |

|              |   |  |
|--------------|---|--|
|              | 3.8 Planning and design of the collection system<br>3.9 Record keeping, control and inventory<br>3.10 Integrating the collection and disposal systems<br>3.11 Operations Research in collection systems   |  |
| <b>10-11</b> | 4. WASTE DISPOSAL<br>4.1 Introduction<br>4.2 Preliminary activities<br>4.3 Physical, chemical and biological processes in a landfill<br>4.4 Design, construction and monitoring of sanitary landfills<br>4.5 Leachate<br>4.6 Landfill Gas<br>4.7 Disposal of hazardous waste<br>4.8 Case Studies<br>4.9 Worked Examples |  |
| <b>12</b>    | <b>EXAM 2</b>   |  |
| <b>13-15</b> | 5.RESOURCE RECOVERY AND WASTE TREATMENT<br>5.1 Introduction<br>5.2 Resource Potential of solid wastes<br>5.3 Processing techniques and equipment<br>5.4 Incineration and energy recovery<br>5.5 Composting and biogas production<br>5.6 Selected materials re.covery<br>5.7 Case Studies<br>5.8 Problems/Questions      |  |
| <b>16</b>    | <b>FINAL EXAM</b>   |  |

**B. Practical part (Please state the titles of the experiments you intend to cover each week)**

The objective of lab is to evaluate different methods in waste minimization, and pollutants reduction. Side effect of waste disposal system, including Lab. Based experiments for different small pilot disposal system, and the negative impacts in surrounding environment. Student will visit stationary disposal sites near Tulkarm, or the main landfill in Zahrat Alfinjan near Jenin, to record the main notes about side effect on surrounded environment and to collect samples to evaluate the type and the nature of soild wastes from the region. Students have to submit their reports after each experiment regularly. Student will be divided into groups, and will work. The detailed information will be provided during the tutorial.

**7. Student assessment methods based on ILO,s**

| No        | Assessment method | Week                   | Mark      | Percentage to overall mark |
|-----------|-------------------|------------------------|-----------|----------------------------|
| <b>1.</b> | First Exam        | <b>7<sup>th</sup></b>  | <b>15</b> | <b>15</b>                  |
| <b>2.</b> | Second Exam       | <b>12<sup>th</sup></b> | <b>15</b> | <b>15</b>                  |

|           |                       |                        |           |           |
|-----------|-----------------------|------------------------|-----------|-----------|
| <b>3.</b> | Lab. Exam and reports | <b>14<sup>th</sup></b> | <b>30</b> | <b>30</b> |
| <b>4.</b> | Coursework            | <b>14<sup>th</sup></b> | <b>10</b> | <b>10</b> |
| <b>5.</b> | Final Exam            | <b>16<sup>th</sup></b> | <b>30</b> | <b>30</b> |

## 8. References and other resources

This course will be mainly based on the course notes and lectures. For references, the following textbooks are recommended:

- Phelps H.O, Heinke G.W, Jonker J.R, Ouano E.A.R and Vandecasteele,C,1995. Management of Solid Waste UNESCO, Paris.
- Chandrappa, R. and Das, D.B., (2012). *Solid waste management principles and practice*, Springer Publication.

### A. Other references

### B. Electronic resources, Websites related to the course

### Name & signature of Head of department/ program leader

Name: ..... signature: ..... Date: .....

### Name & signature of Quality rep. in your faculty

Name: ..... signature: ..... Date: .....

### Course Tutor's name and signature

Name: Dr. Saed Khayat signature: ..... Date: .....