

Department Petroleum Engineering

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# DPE Master Class Concept

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# 1 What is a Master Class?

A master class is a highly efficient way to teach students core know-how in the Master Program 'Petroleum Engineering' within one year. The Chairs of Drilling, Production, and Reservoir Engineering offer one master class per year.

In general, a master class is defined as a collection of 'Integrated Courses' (IV), which are designed to have less than 6 lecturing units of 45 min each per day. Usually, only one individual course is taught on one day. Master class courses consist of 3 different types of lecturing units:

- **Imparting of new Concepts.** New concepts and ideas are taught similarly to traditional lectures (VO) and held by the professors. Courses are designed to have not more than 3 of these units per day and have them preferably held in the morning when students are typically most attentive.
- **Deepening of the Knowledge.** This type is similar to traditional practicals (UE) and held ideally by postdoc researchers or senior lecturers and supported by PhD students. In these lecturing units students learn to use new concepts on the basis of exercises and examples. The practical units are usually held after the theoretical ones – preferably in the afternoon. Additionally, students are encouraged to practice additional examples on their own with PhD students as contact and support ('Free Practice').
- **Application to Engineering Problems.** This last type of lecturing unit closes the value chain for students as theory concepts and practical methods are used to solve engineering problems. Such problems can be assigned as projects or larger exercises either to a single student or to a group of students. However, teamwork must be designed so that students can individually defend their work and can be separately evaluated.

## 2 Master Class Workflow

The organizational framework describes how master class courses are intended to be organized. However, this framework is not a rigid corset. The final course schedule also depends on the course's specific content, focus and availability of external lecturers.

In order to make the description of the organizational framework more tangible, a sample course with 3 ECTS and 2 SWS (= semester weekly hours) is used as an example.

- *3 ECTS of the example course represent  $3 \times 25 \text{ hours} = 75 \text{ hours of total workload for an average student.}$*
- *2 SWS represent  $2 \text{ hours/week} \times 14-15 \text{ weeks/semester} = 28-30 \text{ total hours of contact of the lecturing personal with the students.}$*

### 2.1 Course Phases

#### 2.1.1 Preparation Phase

Each master class course starts with a preparation phase of approximately 10% of the total course workload. The aim of this phase is to reduce unnecessary repetition of basic concepts for the whole class by early identification and support of individual weaknesses of the students.

At the beginning of this phase the required skills and knowledge, course contents, and objectives have to be clearly communicated to the students. Students can use this time to prepare themselves ('self-study') for the course by studying provided and other materials such as specific chapters in related books or scientific papers.

The preparation phase closes with a self-assessment as part of the first lecturing unit in the following lecturing phase. This first assessment is not graded, however, successful completion can earn students up to 10 additional percent ('bonus points') to the maximum regular achievable grade of 100%.

*In the example course the average student would need to invest 7.5 hours in self-studies to prepare for the course.*

#### 2.1.2 Lecturing Phase

The lecturing phase is the main phase of the course and accounts for most of the total workload. The phase consists ideally of one- to two-day-long lecturing blocks. In any case, each day should not exceed the maximum of 6 lecturing units. Each lecturing day can contain up to 3 theory units plus relevant practical units as described in the introduction.

The aim of this phase is to impart new concepts, deepen the students' knowledge by practical work and make the course applicable to engineering problems.

In the first lecturing unit students are assessed with a non-graded test. This test serves on one hand to raise the students' attention if they are well prepared for the course or not. On the other hand lecturers can identify weaknesses of the whole group of students and consider them in the lecturing process.

Moreover, students must be made aware of the relevant grading scheme and the code of conduct within the first lecturing unit. Students have to confirm per signature that they have read, have understood, and have agreed to the grading scheme and code of conduct.

For the rest of the lecturing phase theory units (imparting of new concepts) are combined with practical ones (deepening of the knowledge). Finally, this knowledge is made applicable to real-world problems by assignments of engineering problems as described in the introduction.

*For the example course the 28-30 hours of contact time are divided into 5 days of 6 hours each.*

### 2.1.3 Evaluation Phase

The evaluation phase is not a separate phase per se as integrated lectures have to be assessed continuously. Evaluation is based on a percentage system with a regular maximum score of 100%. Students are graded based on the scheme listed in Table 1.

Table 1—Grading Scheme

| Score (%) | Grade | Name             |
|-----------|-------|------------------|
| > 90      | 1     | "Sehr Gut"       |
| 80 – 89   | 2     | "Gut"            |
| 70 – 79   | 3     | "Befriedigend"   |
| 60 – 69   | 4     | "Genügend"       |
| < 60      | 5     | "Nicht Genügend" |

In general, the continuous assessment includes 2 tests during the lecturing phase of the course, which account each for 15% of the total score. The tests consist of a theory and a practical part. Additionally, the application-oriented work is presented and evaluated for 20% of the total score. A final exam at the very end of the course accounts for 50% of the total score.

Up to 10% of bonus score can be earned by successfully completing the self-assessment in the beginning of the lecturing phase.

NOTE: Every lecturer remains free to evaluate his/her students to his/her personal grading scheme, number of tests and weights of graded elements. However, in such a case the differing grading scheme and method of evaluation must be clearly outlined in the first lecturing unit.

## 2.1.4 Example Schedule

Following the statements from above, an example course schedule could look as described in Fig. 1.

|                    | Week 1          |   |   |   |   |   |   | Week 2 |   |   |   |   |   |   |
|--------------------|-----------------|---|---|---|---|---|---|--------|---|---|---|---|---|---|
|                    | M               | T | W | T | F | S | S | M      | T | W | T | F | S | S |
| 9 am<br>–<br>12 pm | Self-Assessment | 2 | 2 |   |   |   |   | Test 1 | 2 | 2 |   |   |   |   |
|                    | Introduction    | 1 | 1 |   |   |   |   |        | 1 | 1 |   |   |   |   |
| 1 pm<br>–<br>4 pm  |                 | 3 | 3 |   |   |   |   |        | 3 | 3 |   |   |   |   |

  

|                    | Week 3 |   |   |   |   |   |   | Week 4 |   |   |   |                                |   |   |
|--------------------|--------|---|---|---|---|---|---|--------|---|---|---|--------------------------------|---|---|
|                    | M      | T | W | T | F | S | S | M      | T | W | T | F                              | S | S |
| 9 am<br>–<br>12 pm | Test 2 | 2 |   |   |   |   |   |        |   |   |   | Final Exam                     |   |   |
|                    |        | 1 |   |   |   |   |   |        |   |   |   |                                |   |   |
| 1 pm<br>–<br>4 pm  |        | 3 |   |   |   |   |   |        |   |   |   | Project Presentation & Defence |   |   |

**Key**

|  |
|--|
| New Concepts – Theory Lectures (hrs)   |
| Deepening Knowledge – Practicals (hrs) |
| Free Practice / Project Work           |
| Test / Examination                     |
| Project Presentation & Defence         |

Fig. 1—Example Course Schedule