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| <p>Kingdom of Saudi Arabia Ministry of Higher Education Qassim University College of Engineering</p> |  | <p>المملكة العربية السعودية وزارة التعليم العالي جامعة القصيم كلية الهندسة</p> |
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CE 660 Advanced Foundation Engineering

College: Engineering

Department: Civil

First: Course Definition

1- Course Code: CE 660

2- Units: 3

3- Semester:

4- Prerequisite:

5- Co-requisite:

6- Location (if not on main Campus):

Second: Course Objectives

- 1- Cultivate higher level insights in theories for foundation engineering and to promote critical thinking in designing and analyzing foundations.
- 2- Practice above-textbook-level instrumentations and modern equipments in foundation engineering.

Third: Course Specifications

Soil structure interaction, numerical methods for analysis of foundation, bearing capacity and settlement of foundation using in situ tests, load-deformation behavior of axially-loaded piles, prediction of pile capacity during driving, beams and plates on foundations, laterally loaded piles, foundation on difficult soils.

| 1- Topics to be covered | | |
|---|-------------|-------|
| Subject | No of Weeks | Units |
| Designing Stable Foundations | 1 | 3 |
| Theories of Bearing Capacity and Settlement | 2 | 6 |
| Principles for the Design of Foundations | 1 | 3 |
| Geotechnical Design of Shallow Foundations | 2 | 6 |
| Geotechnical Design of Driven Piles Under Axial Loads | 2 | 6 |

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| Geotechnical Design of Drilled Shafts Under Axial Loading | 1 | 3 |
| Fundamental Concepts Regarding Deep Foundations Under Lateral Loading | 1 | 3 |
| Analysis of Individual Deep Foundations Under Axial Loading Using t-z | 1 | 3 |
| Analysis and Design by Computer of Piles Subjected to Lateral Loading | 2 | 6 |
| Analysis of Pile Groups | 1 | 3 |

2- Course components (Total hrs in the Semester): 42

| Lecture | Exercise | Other |
|---------|----------|-------|
| 42 | - | 0 |

3- Intended Learning Outcomes of the Course (ILO's)

a. Knowledge

i) Description of the knowledge to be acquired:

- Analysis and Design of Shallow and Deep Foundations.
- Load-bearing foundations for a variety of building and structural types.
- Design of Driven piles and drilled shafts under axial loads
- Loading analysis to major types of foundations and construction methods.
- Computer-aided analysis and soil-structure interaction.
- Analysis of Pile Groups.

ii) Teaching strategies to be used to develop that knowledge

- Class lectures.
- Term projects.
- Students' presentations.
- Group discussion.

iii) Methods of assessment of knowledge acquired

- Exams.
- Quizzes.
- Homework assignments.
- Term projects.

b- Cognitive (Intellectual) Skills

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i) Cognitive skills to be developed

- Advanced concepts of shallow and deep foundation analysis and design.
- Advanced shallow and deep foundation problem modeling.
- Advanced shallow and deep foundation design alternatives.

ii) Teaching strategies to be used to develop these cognitive skills

- Class lectures.
- Case studies analysis.
- Term projects.

iii) Methods of assessment of students' cognitive skills

- Students' seminars and presentations.
- Term projects.
- Written reports.

c. Interpersonal Skills and Responsibility

i) Description of the interpersonal skills and capacity to carry responsibility to be developed

- Decision making based on engineering analysis.
- Communication skills.
- Team work.

ii) Teaching strategies to be used to develop these skills

- Class lectures.
- Term projects.
- Case studies analysis.

iii) Methods of assessment of students' interpersonal skills and capacity to carry responsibility

- Term project.
- Written reports.
- Students' seminars and presentations.

d. Communication, Information Technology and Numerical Skills

i) Description of the skills to be developed in this domain

- Literature research.
- Problems modeling.
- Utilization of computer applications in analysis and design.

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ii) Teaching strategies to be used to develop these skills

- Class lectures.
- Case studies analysis.
- Computer lab sessions.
- Term projects.

iii) Methods of assessment of students numerical and communication skills

- Term projects.
- Written reports.
- Students' seminars and presentations.

e. Psychomotor (if applicable) & Other Non-cognitive Skills

i) Description of the psychomotor or other skills to be developed and the level of performance required

- NA
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ii) Teaching strategies to be used to develop these skills-

- NA
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iii) Methods of assessment of student's psychomotor skills

- NA
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4- Student Assessment Schedule

| Serial | Assessment tool (test, group project, examination etc.) | Week due | Weight |
|--------|---|------------------|--------|
| 1 | Term Project – 1 | 3 rd | 15 % |
| 2 | Mid Term Exam -1 | 7 th | 15 % |
| 3 | Term Project – 2 | 10 th | 15 % |
| 4 | Term Project – 3 | 13 th | 15 % |
| 5 | Final Exam | 16 th | 40 % |

5- Student Support

- Providing electronic library of textbooks and scientific periodicals.
- Providing the necessary computer applications for the course.

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6- Learning Resources

i) Essential Books (References)

- Das, B. M. "Principles of Foundation Engineering," 7th edition, 2011. CENGAGE L Publishers, ISBN 9780495668107
- Reese, L.C., Isenhower, W.M. and Wang, S.T. "Analysis and Design of Shallow and Deep Foundations," Wiley, 2006

ii) Course Notes

- NA
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iii) Recommended Books

- Bowles, J.E. "Foundation Analysis and Design" McGraw-Hill Book Company, 2001, ISBN-10: 0071188444 and ISBN-13: 978-0071188449
- Kameswara Rao, N. S. V. " Foundation Design: Theory and Practice" Wiley, 2011, ISBN: 0470825340
- Murthy, V. N. S. "Advanced Foundation Engineering: Geotechnical Engineering Series" Amazon Book Company, 2007, ISBN: 9788123915067

iv) Electronic Books & Web Sites:

- Scientific journals and forums.
- Instructor's instruction.

v) Periodicals

- ASCE scientific journals.
- British Geotechnique journal.
- Canadian journal of geotechnical engineering.

7- Course Evaluation and Improvement Processes

i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Students' questioners.
- Students' evaluation of course and instructor.

ii) Other Strategies for Evaluation of Teaching by the Instructor or by the Department

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- Public faculty seminars.
- Assessment by external evaluators of students achievements.

iii) Processes for Improvement of Teaching

- Assessment of students' work by external examiners.
- Analysis of students' evaluation of course and instructor.
- Seminars by industry professionals.

iv) Processes for verifying standards of student achievement

- Check marking by an independent faculty member of a sample of student work.
- Periodic exchange and remarking of a sample of assignments/exams with a external evaluator.

v) Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- A continuous improvement process through adopting a closed loop assessment/improvement. The process depends on assessment by all stake holders for the M.Sc. program educational outcomes followed by instructor/program committee evaluation ending with proposing the necessary improvements.