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

College: College of Engineering (Qassim University)

Department: Mechanical Engineering Department

First: Course Definition

1- Course Code: ME 633

2- Units: 3 credit hrs

3 – Semester : 3rd since this is advanced course

4 -Prerequisite : ME 251, (This course covers advanced subjects in Engineering materials. A first course in Materials Engineering such as ME 251 or similar to it is required before attempting this course)

5- Co-requisite: ME 634

6- Location (if not on main Campus):

Second: Course Objectives

- *Enable Students to recognize the conventional methods for processing of advanced composite materials*
- *Enable Students to distinguish between the available reinforcing fibre performance*
- *Enable Students to recognize the conventional thermo set and thermoplastic polymers*
- *Enable Students to describe the mechanical properties of a collimated fiber, polymer composite as an anisotropic medium*
- *Introduce test methods required to characterize anisotropic medium*
- *Demonstrate how to calculate the thermoelastic response of a composite laminate*

Third: Course Specifications

1- Topics to be covered

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| Subject | No of Weeks | Units |
|--|-------------|-------|
| <i>Introduction and basic refreshing</i> | 1 | 3 |
| <i>smart/functional materials</i> | 1 | 3 |
| <i>smart/functional materials</i> | 1 | 3 |
| <i>high-strength ferrous alloy</i> | 1 | 3 |
| <i>high-strength non ferrous alloys</i> | 1 | 3 |
| <i>super alloys</i> | 1 | 3 |
| <i>high performance polymers</i> | 1 | 3 |
| <i>eco-materials</i> | 1 | 3 |
| <i>thin film science and technology</i> | 1 | 3 |
| <i>advanced joining methods</i> | 1 | 3 |
| <i>processing-structure-property relationship</i> | 1 | 3 |
| <i>damage tolerance</i> | 1 | 3 |
| <i>toughening mechanisms structure integrity and reliability</i> | 1 | 3 |
| <i>Mini project submission</i> | 2 | 6 |
| <i>Final Exam</i> | | |

2- Course components (Total hrs in the Semester)

| Lecture | Exercise or lab | Other |
|---------|-----------------|-------|
| 45 | ---- | -- |

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

a. Knowledge

i) Description of the knowledge to be acquired:

Defined important terms associated with the course

- Recall the various material failure criterions and their appropriate application
- Analyze the derivation of equations derived in the course and coding in Excel
- List the various assumptions associated with the materials

ii) Teaching strategies to be used to develop that knowledge

- Lectures
- Class discussions
- Reading assignments and research (internet or books)

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- iii) Methods of assessment of knowledge acquired*
- Home assignments
 - Quizzes
 - Exams

b- Cognitive (Intellectual) Skills

- i) Cognitive skills to be developed*
- Discuss the usefulness and limitation of the material for real life problems
 - Transformation of a materials into a mathematical problem to enable estimations of strengths as well as safety assessment of materials.
 - Combining material and some analysis together with failure theory in order to design a safe structure specially at advanced levels.

- ii) Teaching strategies to be used to develop these cognitive skills*
- Lectures
- Case studies
 - Class discussions
 - Reading and research assignments

- iii) Methods of assessment of student's cognitive skills*
- Home assignments
 - Quizzes
 - Exams
 - Projects

c. Interpersonal Skills and Responsibility

- i) Description of the interpersonal skills and capacity to carry responsibility to be developed*
- Team work & Sharing of ideas with colleagues
 - Time management

- ii) Teaching strategies to be used to develop these skills*
- Class work and discussions
 - Team projects
 - Home assignments

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- iii) Methods of assessment of student's interpersonal skills and capacity to carry responsibility*
- Peer-peer assessments in projects of materials
 - Project
 - Home assignments with specified and enforced deadlines

d. Communication, Information Technology and Numerical Skills

- i) Description of the skills to be developed in this domain*
- Conveying ideas in a systematic and coherent manner
 - Report writing & Use of internet

- ii) Teaching strategies to be used to develop these skills*
- Class discussion
 - Home assignments
 - Project assignments
- iii) Methods of assessment of students numerical and communication skills*
- Project reports with 10-15 min 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*
- Nil

- ii) Teaching strategies to be used to develop these skills-*
- Nil

- iii) Methods of assessment of student's psychomotor skills*
- Nil

4- Student Assessment Schedule

| Assessment | Assessment task (test, group project, examination etc.) | Weight of |
|------------|---|-----------|
| 1 | Quizzes and Home works | 10 % |
| 2 | General Performance/ Attendance | 2 % |

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| 3 | Mid Term Exam1 | 15 % |
| 5 | Mid Term Exam2 | 15 % |
| 6 | Mini Project, Home Assignment | 15 % |
| 7 | Final Exam | 43 % |

5- Student Support

Office hours: 4hrs a week

6- Learning Resources

i) Essential Books (References)

- .1J. P. Den Hartog, *Advanced Strength of Materials*, Wiley, 1987.
- .2William D. Callister, David G. Rethwisch, *Fundamentals of Material Science and Engineering: An Integrated Approach*, Wiley 2008.

ii) Course Notes

Depending on the class ppts will be provided

iii) Recommended Books

Engineering Materials: Properties and Selection, 9/E, Kenneth G. Budinski, ISBN-10: 0137128428, ISBN-13: 9780137128426, Prentice Hall

iv) Electronic Books & Web Sites:

Course website (Course material, recommended articles, homework, project details, announcements etc)

v) Periodicals

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7- Course Evaluation and Improvement Processes

i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching
Students feedbacks

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

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iii) Processes for Improvement of Teaching
Analyzing the surveys and feedbacks
-Updating the course with latest IT developments so that pupils gain maximum of it

iv) Processes for verifying standards of student achievement (e.g. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)
-Marking of student work/result with course coordinator/chairman
-Analyze and compare the performance with rest of courses

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

- The course evaluations completed by the instructor are reviewed every semester by a subject committee.
- Summarized and put up to the Department Council Meeting.
- Further analysis and discussion; the suggestions for modification of the course are brought to the college council.
- Approval from the college council; the suggestions can be incorporated in the course