Kingdom of Saudi Arabia Ministry of Higher Education **Qassim University** College of Engineering		المملكة العربية السعودية وزارة التعليم العالي **جامعة القصيم** **كليه الهندسه**

GE 608 : Experimental Methods and Analysis

College: Engineering

Department: Mechanical

First: Course Definition

1- Course Code: GE 608

2- Units: 3

3 – Semester : 1st

4 -Prerequisite : --

5- Co-requisite

6- Location (if not on main Campus):

Second: Course Objectives

1. To provide the Masters student with hands on experience on design of experiments as practiced in the industry.
2. To learn the application of statistical techniques and concepts to maximize the amount and quality of information resulting from experiments.
3. To have exposure to commercial statistical software used in the industry

Third: Course Specifications

1- Topics to be covered

Subject	No of Weeks	Units
Part I: Design of Experiments Introduction to Industrial Experimentation,	1	3
Fundaments of Design of Experiments,	1	3
Understanding Key interactions, Mean Effect Plots, Interaction Plots,	1	3

Full Factorial Design, Partial Factorial Design,	1	3
Error and Variance.	1	3
Part II: Statistical Techniques Basic Statistical measurements and their application in Engineering	1	3
Statistical analysis of data. P-value plots, α plots.	1	3
.Probability distributions, sampling distributions, estimation and confidence intervals for parameters of statistical distributions,	1	3
hypothesis testing, design and analysis of variance for estimation and confidence intervals for parameters of non-statistical models.	1	3
single and multiple-factor experiments, regression analysis,	1	3
Part III: Use of Commercial Software for Analysis of Experiments (LabView, MiniTab)	1	3
Use of commercial software for the application of above topics in Design of Experiments and Statistical Techniques.	1	3
Mini Project Discussions	1	3
Mini Project Presentations	1	3

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

Lecture	Exercise or lab	Other
42	--	--

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

a. *Knowledge*

i) Description of the knowledge to be acquired:

Understanding of how to design an experiment in industry

- Understanding of Key statistical parameters and techniques
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ii) Teaching strategies to be used to develop that knowledge

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Lectures
Home Assignments
Discussions in the Class
Case study
Mini project (Design)
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iii) Methods of assessment of knowledge acquired

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Quizes: to assess understanding of fundamentals of Experimental Methods.
Discussion Groups: to assess interactive and communication abilities**.**
Midterm Exams: to assess understanding of experimental methods and statistical techniques.
Final Exam: to assess **understanding** of different aspects of experimental methods and statistical techniques. .
Mini project: to assess **practical hands-on** application of experimental methods and statistical techniques.

b- Cognitive (Intellectual) Skills

i) Cognitive skills to be developed

- Ability to analyze, design and assess a mechanical system or process using statistical techniques.
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ii) Teaching strategies to be used to develop these cognitive skills

- Lectures
Home Assignments
Discussions in the Class
Case study
Mini project (Design)

iii) Methods of assessment of students cognitive skills

Quizes: to assess understanding of fundamentals of Experimental Methods.
Discussion Groups: to assess interactive and communication abilities**.**
Midterm Exams: to assess understanding of experimental methods and statistical techniques.

Final Exam: to assess **understanding** of different aspects of experimental methods and statistical techniques. .
Mini project: to assess **practical hands-on** application of experimental methods and statistical techniques.

c. Interpersonal Skills and Responsibility

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

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- Team work
- Ideas development and sharing with others

ii) Teaching strategies to be used to develop these skills

- Case Studies, Mini Project
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iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

- Group discussions
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d. Communication, Information Technology and Numerical Skills

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

- Use of commercial software for analysis of experiments and statistics
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ii) Teaching strategies to be used to develop these skills

- Lectures
- Home Assignments
- Discussions in the Class
- Case study
- Mini project (Design)

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iii) Methods of assessment of students numerical and communication skills

Quizes: to assess understanding of fundamentals of Experimental Methods.
Discussion Groups: to assess interactive and communication abilities**.**
Midterm Exams: to assess understanding of experimental methods and statistical techniques.
Final Exam: to assess **understanding** of different aspects of experimental methods and statistical techniques. .
Mini project: to assess **practical hands-on** application of experimental methods and statistical techniques.

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

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

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iii) Methods of assessment of student's psychomotor skills

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4- Student Assessment Schedule

Assessment	Assessment task (test, group project, examination etc.)	Weight of
1	Quizzes	10 %
2	General Performance/ Attendance	2 %
3	Mid Term Exam1	15 %
5	Mid Term Exam2	15 %
6	Mini Project, Home Assignment	8 %
7	Final Exam	50 %

5- Student Support

Extra office hours available to the student to discuss course material and mini project with the instructor.

6- Learning Resources

i) Essential Books (References)

Design of Experiments for Engineers and Scientists by Jiju Antony, McGraw Hill, 2003-

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ii) Course Notes

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iii) Recommended Books

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iv) Electronic Books & Web Sites:

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v) Periodicals

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7- Course Evaluation and Improvement Processes

i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- End of semester teaching evaluations through survey forms
- End of semester course evaluations through survey forms

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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

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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)

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

- *The course evaluations done by the instructor are reviewed every semester by a subject committee. The improvements are debated, summarized and put up to the Department Council Meeting. After further debate and discussion the suggestions for modification of the course are sent forth to the college council. After approval from the college council the suggestions can be incorporated in the course.*

Advanced Topics in Power Electronics

College: Engineering

Department: Electrical

First: Course Definition

1- Course Code: EE 632

2- Units: 3 credit hrs

3- Semester:

4- Prerequisite:

5- Co-requisite:

6- Location (if not on main Campus):

Second: Course Objectives

- Developing the knowledge of the students in some advanced rectifier converters such as star-double star with inter-phase reactor and12 pulse rectifiers

- Developing the knowledge of the students in rectifier converter operation (overlap, regulation, and power factor)
- Developing the knowledge of the students in frequency converters
- Developing the knowledge of the students in three-phase ac voltage controllers, Developing the knowledge of the students in thyristor commutation techniques and triggering circuits
- Developing the knowledge of the students in some applications of power electronics.
- Developing the skills of the students regarding the analysis of converters.
- Acquainting the students with the necessary information and skills for designing semiconductor converters

Third: Course Description

1- Topics to be covered

Subject	No of Weeks	Units
I- Rectifier Converter Operation 1.1- Overlap 1.2- Voltage Regulation 1.3- Power Factor and Its Control 1.4- Inversion	2	6
II- Advanced Rectifier Converters 2.1- Three-Phase Zigzag Rectifier 2.2- Delta/ Delta Bridge 2.2- Star/Double Star with Interphase Reactor	2	6
III- AC Voltage Controller	1	3
IV- Cycloconverter 4.1- Single-Phase Cycloconverter 4.2- Three-Phase Cycloconverters 4.3- Blocked Group Operation 4.4- Circulating Current Mode	2	6
V- Thyristor Commutation Techniques	2	6
VI- Inverters 6.1- Single-Phase Bridge Inverter 6.2- Three-Phase Inverter 6.3- Constant-Voltage Source Inverter 6.4- Constant Current Source Inverter	2	6
VII- Harmonics 7.1- Harmonic Analysis 7.2- Load Aspects 7.3- Supply Aspects 7.4- Passive and Active Filters	1	3
VIII- Thyristor Triggering Circuits	1	3

IX- Power Electronics Applications	1	3

2- Course components (Total hrs in the Semester): 45

Lectures	Exercises	Other
45	---	----

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

a. *Knowledge*

i) Description of the knowledge to be acquired:

- Advanced rectifier converters (star-double star with inter-phase reactor, 12 pulse rectifiers)
- rectifier converter operation (overlap, regulation, and power factor)
- frequency converters,
- performance of three-phase ac voltage controllers
- thyristor triggering circuits and thyristor commutation techniques,
- harmonics
- applications of power electronics

ii) Teaching strategies to be used to develop that knowledge

- Class lectures.
- Students' presentations
- Group discussion in the Class
- Assignments
- Case study Report (data collection, internet search, and reporting

iii) Methods of assessment of knowledge acquired

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

b- Cognitive (Intellectual) Skills

i) Cognitive skills to be developed

- The ability to analyze, and determine the dc drives performance characteristics.
- The ability to analyze, and determine the ac drives performance characteristics.
- The ability to select the suitable driver for a certain load

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' **s**eminars 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

- Reports.
- Term team projects.
- Presentations and seminars

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

- *Evaluation of the team* projects.
- Written reports.
- Students' **s**eminars and presentations.

d. Communication, Information Technology and Numerical Skills

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

- Literature search.
- Problems numerical modelling.
- Utilization of computer applications in analysis and design.

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

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

- NA

iii) Methods of assessment of student's psychomotor skills

- NA

4- Student Assessment Schedule

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

5- Student Support

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

6- Learning Resources

i) Essential Books (References

- C. W. Lander, "Power Electronics", McGraw-Hills Book Company, London
- M. H. Rashid, "Power Electronics- Circuits, Devices, and Applications", third Edition, Prentice-hall, USA, 2004.

ii) Course Notes Course materials are uploaded on the College Web-Site (www.qec.edu.sa) to be available for the students.

iii) Recommended Books

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iv) Electronic Books & Web Sites:

- Scientific journals and forums.

v) Periodicals

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7- Course Evaluation and Improvement Processes

i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Students' Questionnaires,
- Observing the students opinions recorded in the college student site
- Appeal box
- Carrying out extensive questioners by a sample of the distinguished students just after the graduation from the college.-

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

- Instructor report
- Public faculty seminars.
- Periodical review of the teaching methods by both the department council and the education affairs vice dean.-

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.
- Evaluation of the course outlines and student works by external staff member,
- Periodical contact with different engineering authorities and industries for evaluating and getting their feedback and suggestions concerning the course outlines.

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.

- Assessment and evaluation of the level of achieving the course outcomes through a continuous improvement process (part of a quality assurance system established by the university),
- Consequently, actions are to be taken to improve the course delivery when necessary.
- Review of the course objectives, outcomes and curriculum every 2 years.