جامعة أم القرى

كلية الهندسة والعمارة الإسلامية

الماجستير في الهندسة الميكانيكية

Program units and courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses	Units	Courses
compulsory courses	18	7	12	4	15	5	18	6	6	2	12	3
Elective courses	6	2	12	4	9	3	12	4	30	10	24	8
Thesis - Research Project	8	Thesis	12	Project	9	Thesis	3	Project	12	Thesis	6	Project
Total	32	14	36	9	33	9	33	11	42	13	42	12

4. Learning and Teaching

4/1 Learning Outcomes and Graduate Specifications

4/1/1 Main tracks or specializations covered by the program:

(a) Manufacturing and Materials Engineering
(b) Power Plants and Renewable Energies

4/1/2 Curriculum Study Plan Table

Level	Course Code	Course Title	Required or Elective	Prerequisite Courses	Credit Hours
Level 1	804601-4	Advanced Engineering Mathematics	R	---	4
	804602-4	Numerical Modelling in Mechanical Engineering	R	---	4
	804603-4	Research Methods	R	---	4
Level 2	804699-6	Research Project (continued)	R	---	6
	8046xx-3	Elective Course from any Track	R	Supervisor Approve	3
	8046xx-3	Elective Course from the corresponding Track	R		3
Level 3 and Level 4 Student must study and finish six course from his track					
Level3	8046xx-3	elective Course from the corresponding Track	R	Supervisor Approve	3
	8046xx-3	elective Course from the corresponding Track	R		3
	8046xx-3	elective Course from the corresponding Track	R		3
Level 4	8046xx-3	elective Course from the corresponding Track	R	Supervisor Approve	3
	8046xx-3	elective Course from the corresponding Track	R		3
	8046xx-3	elective Course from the corresponding Track	R		3
Track (a)	804604-3	Design of Experiments	E	Supervisor Approve	3
	804605-3	Thermal Analysis of Materials	E		3
	804606-3	Solidification and Crystallization	E		3
	804607-3	Advanced Composite Materials	E		3
	804608-3	Polymers	E		3
	804609-3	Phase Transformation	E		3
	804610-3	Computer Aided Manufacturing (CAM)	E		3
	804611-3	Forming and Shaping processes	E		3
	804612-3	Finite element Analysis and its applications	E		3
	804613-3	Mechanical Behavior of Engineering Materials	E		3
	804614-3	Fault diagnosis	E		3
	804615-3	Failure Analysis	E		3
	804616-3	Optimization methods in Manufacturing	E		3

	804617-3	Statistical Methods for Quality Control and Reliability	E		3
	804618-3	Operation Research and Optimization	E		3
	804619-3	Nanomaterials and their Advanced Applications	E		3
	804695-3	Special Topic I	E		3
	804696-3	Special Topic II	E		3

Comments of Reviewers 1 and 3. The required modifications have been done **:Commented [m@1]**

Track (b)	804620-3	Fundamentals of Nuclear Energy	E	Supervisor Approve	3
	804621-3	Solar Thermal Energy Applications	E		3
	804622-3	Wind Energy Conversion	E		3
	804623-3	Photovoltaic Technology	E		3
	804624-3	Introduction to Renewable Energy Systems	E		3
	804625-3	Fuel Cells	E		3
	804626-3	Water Desalination	E		3
	804627-3	Energy Storage	E		3
	804628-3	Computational Fluid Dynamics	E		3
	804629-3	Energy Management and conservation	E		3
	804630-3	Power Plants Technology	E		3
	804631-3	Advanced Heat Transfer	E		3
	804632-3	Biofuels, Biomass and wastes Energy	E		3
	804633-3	Turbomachinery	E		3
	804634-3	Advanced Fluid Mechanics	E		3
	804697-3	Special Topic I	E		3
	804698-3	Special Topic II	E		3

Comments of Reviewers 1 and 3. The required modifications have been done **:Commented [m@2]**

4/1/3 Field or Research Components of the Study Plan

4/1/3/1 Summary of Practical or Medical Clinical Fellowship Components Required by the Program (if any): *Not applicable in this program*.

a) Brief Description of Field Experience:
b) Program Level (s) of Field Experience:
c) Contact Hours of Field Experience and Time Table (Day / Week / Semester)
d) Field Experience Credit Hours:

COURSE SPECIFICATIONS

Form

Course Title: Advanced Engineering Mathematics

Course Code: 804601-4

Date: 2018-10-27	**Institution**: Umm Al-Qura University.
College: Engineering and Islamic Architecture **Department**: Mechanical Engineering.	

A. Course Identification and General Information

1. Course title and code: Advanced Engineering Mathematics-804601-4
2. Credit hours: 4 hours/week
3. Program(s) in which the course is offered. M. Sc.

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course: Prof. Hamdy M. Youssef
5. Level/year at which this course is offered: First level / M. Sc.
6. Pre-requisites for this course (if any): B. Sc.
7. Co-requisites for this course (if any):
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	■	percentage?	100%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

   Develop the advanced knowledge of the M. Sc. students in different topics of engineering mathematics to increase capability to formulate and solve engineering problems based on mathematical basis. Moreover, to enhance they skills to use and apply the mathematics on any engineering problems.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

   To develop and improving the course, mathematical software will be used on some topics of the course like MAPLE, MATHEMATICA … etc. The student will be asked to do some of the homework through online and depends on new materials and research.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description: The first part of the course is the Laplace transform with all theorems and method (First shift- Second Shift-Laplace derivative-derivative of Laplace-Unit step function-Delta function-Convolution theorem-Applications). The second part is the Fourier series transform (For any period function- With special period-Sine and Cosine transform-Complex form of Fourier). The third part is the partial differential equation (Classification-Method of solution-Heat equation-Wave equation-Applications). The fourth part is the advanced vector calculus (Vector functions-Motion on a curve- partial vectors derivative- curl and divergence- line integral-double integral- Green's theorem-surface integrals- Stock's theorem-triple integrals- divergence theorem).

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Laplace Transforms and its Applications	4	16
Fourier Series Transform	2	8
Partial Differential Equations(Heat and Wave equations)	4	16
Advanced Vectors Calculus	5	20
Total	15	60

2. Course components (total contact and credit hours per semester):							
		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	60					60
	Actual	60					60
Credit	Planned	60					60
	Actual	60					60

3. Individual study/learning hours expected for students per week.	4

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Outline the important basic definitions and the tools of engineering mathematics and its concepts and learn how to apply in actual engineering problems.	1- Delivered through a sequential delivery of lectures in class. 2- Homework	Quizzes: short evaluation to know if they gained the required skills. Homework: to assess if they can solve the problems. Midterm Exams: to assess understanding of basic of surveying principles, problem solving Final Exam: to assess the capability and the skills over the entire course.
1.2	Gain high level of skills of how to formulate the engineering problems based on mathematical basics and how to solve it.		
2.0	**Cognitive Skills**		
2.1	Students will be able to apply the knowledge of engineering mathematics area and their techniques used to solve engineering applications based on	Attending: Lectures, tutorials are followed by examples, some of which are practical in	Quizzes: short evaluation to know if they gained the

	mathematical formulation	nature, to illustrate the planning techniques and skills. Investigating: Self Learning from text books International and recent references in teaching.	required skills. Homework: to assess if they can solve the problems. Midterm Exams: to assess understanding of basic of surveying principles, problem solving Final Exam: to assess the capability and the skills over the entire course.
2.2			
3.0	**Interpersonal Skills & Responsibility**		
3.1	Attendance of classes	Class discussions help students to learn	Traditional classes with some discussions
3.2	Students will take the responsibility to solve examples	Assess the homework with deadlines. Help students to manage their free time	
4.0	**Communication, Information Technology, Numerical**		
4.1	Using power point and word processors to show some engineering applications.	Class discussions allow students to develop communication skills. Homework and assignments encourage use of internet in finding alternative solutions to problems. Use computational tools Writing reports	Quizzes, Midterm and final exams. Assignment homework to assess technical problems solving abilities.
4.2	Using mathematics software to solve the numerical calculations.		
4.3	Students will gain a lot of information by searching through the internet and references in order to solve problems relevant to this course.		
5.0	**Psychomotor(if any)**		
5.1	Not Applicable		
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Exam1	7	20%
2	Exam2	12	20%
3	Essay	15	10%
4	Final Exam	16	50%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

The student can attend to the office of the lecturer of the course to ask for any comment and to understand what he missed in the class (Office hours).

E Learning Resources

1. List Required Textbooks

1. **Advanced Engineering Mathematics, Erwin Kreyszig, 10th. Edition, Wiley, 2011.**

2. **Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, 4th. Edition, Jones and Bartlett Publishers, 2011.**

2. List Essential References Materials (Journals, Reports, etc.)

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
https://www.pdfdrive.com/advance-engineering-mathematics-books.html

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

MAPLE, MTHEMATICA, MatLap

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

Classrooms

2. Technology resources (AV, data show, Smart Board, software, etc.)

Data show , Software, Microsoft

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

By using questionnaires with analysis

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department

Analysis of the final results

3. Procedures for Teaching Development

5. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **Discuss the results according to any standard benchmark and the standard normal distribution of the marks.**
6. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **By the end of the academic term, make analysis to the results and the questionnaires of the student to stand on the effectiveness of the course on the student skills and to know the disadvantages and how to fix them.**

Name of Course Instructor:
Prof. Hamdy M. Youssef

Signature: **H. Youssef** **Date Completed: 25 October 2018**

Program Coordinator: Prof. Mohamed Korrany Hassan

Signature: _____ **Date Received: 2/11/2018**

COURSE SPECIFICATIONS

Form

Course Title: Numerical Modeling in Mechanical Engineering

Course Code: **804602**–4

Date: 20 18–27–11.	**Institution**: Umm Al-Qura University
College: College of Engineering & Islamic Architecture.	**Department**: Mechanical Engineering department

A. Course Identification and General Information

1. Course title and code: Numerical Modeling in Mechanical Engineering- 804602
2. Credit hours: 4
3. Program(s) in which the course is offered. Mechanical Engineering Program

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course Dr. Abdulmannan A. Saati
5. Level/year at which this course is offered: Fall 2019-2020
6. Pre-requisites for this course (if any): Partial diffraction Equation & Programing Language
7. Co-requisites for this course (if any):
8. Location if not on main campus: All sections are taught in the same location on the main campus
9. Mode of Instruction (mark all that apply):

a. Traditional classroom		percentage?	70
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	5
d. Correspondence		percentage?	10
f. Other		percentage?	15

Comments:

B Objectives

1. The main objective of this course: In the introduction, and overview is presented of the different type of applications in mechanical engineering and energy sciences focusing on common properties for numerical simulation. The governing partial differential equations are formulated and complemented with boundary conditions and initial conditions. The finite-difference technique and the finite-volume technique are treated,

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description: In the introduction to the course, the different types of applications in mechanics are formulated in a manner that should allow to start simulation. For a wide range of applications, the ruling differential equations are formulated and completed with the boundary conditions and preliminary conditions.
Afterwards, the simulation principles of finite-difference and finite-volume discretization techniques will be discussed.

For these methods, the basic principles of model formation and solving techniques are presented. Next to this, attention will also go to the conditions which a model should meet for the results to be considered reliable.
During the lectures, all principles are explained and during the semester the students make models with commercial software. They also program parts of solving procedures in MATLAB.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
1) Spatial discretization and interpolation	4	4
2) Discrete implementation of boundary conditions	4	4
3) Time integration schemes	4	4
4) Linearization of non-linear governing systems	12	12
5) Introduction to the use of finite-volume discretization for the numerical simulation of Navier-Stokes equations	8	8
6) Mathematical characterization of partial differential equations and consequences for the selection and placement of boundary conditions	8	8
7) Taylor series development for determination of accuracy of numerical schemes, and consequences for convergence properties	8	8

8) Analysis of numerical stability using Von Neuman analyses, etc.	4	4

2. Course components (total contact and credit hours per semester):							
		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	52					52
	Actual						
Credit	Planned	52					52
	Actual						

3. Individual study/learning hours expected for students per week.	12

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Lectures:** Students are able to explain modern methods for the numerical simulation of phenomena and systems in mechanical engineering;	Lectures Exercise	Quizzes, Exams
1.2	For simple problems, students are able to elaborate a numerical discretization method into a computational code, and verify and validate their implementation.	Exercises Project	Home Works & Application project
1.3	They can use modern commercial software, and can argument good choices of available techniques, and simulation set-up.	Exercises	Application project
1.4	Finally, students are able to perform a critical assessment of simulation results, based on appropriate mathematical relationships for analysis of numerical methods.	Project	Final project
2.0	**Cognitive Skills**		

2.1	The student is able to implement, simulate, and analyze simple 1D and 2D problems from mechanical engineering or energy sciences.	Lectures & Exercise	Quizzes
2.2	Starting from different governing equations in the domains of mechanical engineering and energy sciences, the student recognizes the structure and common elements which lead to the formulation of a set of generic numerical discretization schemes.	Lectures & Exercise	Quizzes & Exams
2.3	He can argument correct choices for the formulation of partial differential equations and boundary conditions, and is able to implement their numerical discretization for simple model problems.	Project	Project & Exams
2.4	The student is able to describe, explain, and use finite-difference and finite-volume discretization techniques. Moreover is able to perform a critical analysis of discretization methods based on techniques for evaluation of accuracy, stability, and convergence.	Lectures & Final Project	Final Project & presentation
3.0	**Interpersonal Skills & Responsibility**		
3.1			
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1	The student understands, and is able to discuss the potential and limitations of different discretization techniques and methods for numerical analysis.	Project	Presentation
4.2			
5.0	**Psychomotor(if any)**		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Quizzes	Every week	10%
2	Home Works	End of chapter	10%
3	Exams	Week (8)	15%
4	Project – 1	Week (4)	5%
5	Project – 2	Week (6)	5%
6	Project – 3	Week (10)	5%
7	Final Project & presentation	Week (14)	25%
8	Final Exam	Week (15)	25%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

E Learning Resources

1. List Required Textbooks Anderson, J. D. Jr. (1995) Computational Fluid Dynamics, McGraw-Hill Inc., New York.
2. List Essential References Materials (Journals, Reports, etc.) Anderson, D.A., Tannehill, J.C. and Pletcher, R.H. (1984) Computational Fluid Mechanics and Heat Transfer, Hemisphere Publishing Corp., Washington D.C., USA Briggs, W.L. (1987) A Multigrid Tutorial, Society for Industrial and Applied Mathematics, Philadelphia, Pennsylvania, USA Celik, I.B. (2001) Introductory Numerical Methods for Engineering Applications, Ararat Books & Publishing, Morgantown WV, ISBN: 0-9713403-0-7 Celik, I., Chen,C.J., Roache, P.J., and Scheuerer, G. (1993) Quantification of Uncertainty in Computational Fluid Dynamics, ASME Fluids Engineering Division, FED-Vol. 158. Ferziger, J.H. and Peric, M. (1995) Computational Methods for Fluid Dynamics, Springer-Verlag, New York.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. NAN
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Languages: Fortran or C++ & MATLAB.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Classrooms and computer laboratories
2. Technology resources (AV, data show, Smart Board, software, etc.) commercial software. They also programmed part of solving procedures in MATLAB.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Computer laboratory equipment with Languages: Fortran or C++ & MATLAB.

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching Home Works, Quizzes, & Project
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department Final Project & presentation: Oral Exam evaluated by an independent member teaching staff

3. Procedures for Teaching Development Solving Selected Application project
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) check marking by an independent member teaching staff of a sample of student's work
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. Based on **Course Assessment and CLO will be developed.**

Name of Course Instructor: Dr. Abdulmannan A. Saati

Signature: _____ Date Completed:4-11-2018

Program Coordinator: Prof. Mohamed Korrany Hassan

Signature: _____ Date Received: 2018/11/9

COURSE SPECIFICATIONS

Form

Course Title: Research Methods

Course Code: 804603-4

Date: 18–10–2018.	**Institution**: Umm Al-Qura University
College: College of Engineering and Islamic Architecture **Department**: Mechanical Engineering	

A. Course Identification and General Information

1. Course title and code: Research Methods 804603-4
2. Credit hours: 4
3. Program(s) in which the course is offered. M.Sc. in Mechanical Engineering

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course: Professor Dr. Muhammad N. Radhwi
5. Level/year at which this course is offered: Fifth level
6. Pre-requisites for this course (if any): M. Sc. Status
7. Co-requisites for this course (if any): None
8. Location if not on main campus: Main campus
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	✓	percentage?	100
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course: To have students gain skills on how to plan, organize, conduct, publish and diffuse a research work in the field of mechanical engineering.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description: Introduction to research - Types of research - Kansei engineering - Topic selection – Data sources and collection – Data analysis – Special Tools – publication - diffusion - Real life case study research project. Emphasis on real life examples is required for each topic.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
1. Introduction: Contemporary issues, ethical consideration (Plagiarism, iThenticate and Turnitin), literature review, methodological issues, research proposals for funding.	2	8
2. Quantitative Research Designs: Experimental, predictive and single-case research designs.	2	8
3. Qualitative Research Designs: Case study/survey research, grounded theory methodology, phenomenological research, narrative/interpreting lived experience.	2	8
4. Kansei engineering.	1	4
5. Data: Types, sources, collection, evaluation, management and analysis tools/software.	2	8
6. Special Tools: Mathematical/OR models, deterministic models, stochastic/simulation models, optimization.	2	8
7. Research papers: Types, presenting/sharing the research project, report, thesis or an article: Oral/written with its all required components.	4	16
8. Diffusion: Readability/impact factor, protection and exploitation of intellectual property.	1	4

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	64					64
	Actual	64					64
Credit	Planned	4					4

	Actual	4					4

3. Individual study/learning hours expected for students per week. 6 hours

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Deep Understanding of the basic concept, principles and theories on how to plan, organize and conduct research in the field of mechanical engineering.	• Lectures: given on topics as class progress, with especial consideration within the class to link the existing topic with students' existing knowledge and further with the general overview. • Review: review the content of each lecture and clarify any matters not clear to make sure comprehensive and deep understanding of the topics concepts, principles, theories and applications to local as well as global environments in the field of mechanical engineering.	As class/topics progress, assignments/homework are assigned and fill-in-blank knowledge items on the midterm and final exams are given.
1.2	Deep Understanding of the basic concept, principles and theories of publishing and diffusing a research work.		
1.3	Able to perform a research work based on real life field case study in mechanical systems including modern knowledge application and realization to	Real life Case Study Research Project: Small groups of students (around 4) are assigned	Each student required to present periodic updates and the final work of the

	recent regulations/procedures locally as well as internationally.	to join in a team work; which includes selecting a real life case study research work proposed by team members, perform and continue to cover the research work in parallel to related class lectures, present periodic updates, present the final work to class and submit the final professional report (the work, which should be completed by week 15, involves generating/collecting data, look up of reference materials, websites and use of computing analysis software).	project to class (five updates and a final presentation, involves students actual contribution to the project and reflecting his independent research abilities). In addition, a final professional report of the project for the team work is submitted at the end of the term.
2.0	**Cognitive Skills**		
2.1	Able to apply continuously theoretical/practical knowledge of real life research work concepts and techniques in solving/designing engineering problems of various systems in an integrated knowledge/experience environment and in a variety of context.	• Extensive engineering application examples given in lectures along with class materials as class progress. • Learning encouraged by use of analytical tools in different applications and through discussion of potential application in other areas. • Assignment tasks include some open ended tasks designed to use real life data, reference materials and apply predictive, analytical and problem solving approach.	• Problem solving questions are given at the end of each topic, on midterm exam and on end of semester final examination. • Real life Case Study Research Project requires application of analytical tools in problem solving tasks in a variety of contexts.
2.2	Able to perform large-scale scientific work independently by applying students' knowledge/experience.		
3.0	**Interpersonal Skills & Responsibility**		
3.1			
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1	Ability to communicate and use techniques and modern engineering tools effectively using real life data analysis research work concept/information.	In the real life case study, students required to make periodic updates, a full scale final presentation	Assessments of students assignment work include expectation of adequate use of

		of the work to class and submit a written professional report, which require proper style and referencing format as specified in graduate study manual.	numerical and communication skills, in addition to interpretation of collected data and information.
4.2			
5.0	**Psychomotor(if any)**		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Real life case study Project update 1	3	2%
2	Real life case study Project update 2	6	2%
3	Mid-Term Test	8	15%
4	Real life case study Project update 3	9	2%
5	Real life case study Project update 4	12	2%
6	Real life case study Project update 5	14	2%
7	Final Presentation for the Real life case study Project	15	10%
8	Final Professional Report for the Real life case study Project	15	30%
9	Final Test	16	35%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week): At least an hour for each class/session.

E Learning Resources

1. List Required Textbooks • Tony Greenfields and Sue greener, Research Methods for Postgraduates, 3rd Edition, John Wiley & Sons, 2016.
2. List Essential References Materials (Journals, Reports, etc.) • Carl J. Sheperis, J. Scott Young and M. Harry Daniels, Counseling Research: Quantitative, Qualitative, and Mixed Methods, 2nd Edition, Pearson, 2016.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) • A lecture room with a capacity of 35 students per session is reasonable.
2. Technology resources (AV, data show, Smart Board, software, etc.) • Computer access of a PC with Microsoft office installed.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) none

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching • Confidential completion of standard course evaluation survey. • Focus group discussion with small (as well as large) groups of students.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Direct assessment: evaluation of all assessment tasks' grades for each student. • Indirect assessment: evaluation of student surveys. • Comparison of Direct and Indirect assessments.
3. Procedures for Teaching Development • Based on direct/indirect assessments' results and confidential surveys/focus group discussion results, improvement actions are taken (including teaching methods and strategies).

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) • Samples of graded examination papers and assignment tasks are check marked by an independent member teaching staff.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • Periodic peer review feedback on the quality of the course are conducted and planned remedial/improvements' actions are taken.

Name of Course Instructor: Professor Dr. Muhammad N. Radhwi
Signature: _____ Date Completed: October 21, 2018

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 4/11/2018

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Professor Dr. Muhammad N. Radhwi**	
Degree:	**Ph.D.**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Industrial Engineering**	**University of Central Florida, USA**	**1986**
M.Sc.	**Industrial Engineering**	**University of Central Florida, USA**	**1982**
B.Sc.	**Mechanical Engineering**	**KFUPM, KSA**	**1977**

Employment:

Position	Employer	Period
Professor	**UQU**	**1997-present**

Supported research and development projects related to specialization:

Date	Project title	Amount of funding

Patents and Copyright:

Title	Date

Publications (published papers and books):

1. M. Habash, W. Sindi and M. Radhwi "Efficiency Calculation of a combined Cycle in a Power Plant", ICFD13, 2018.
2. M. Radhwi and A. AbdelGawad "Simulation of Movement Of Fire and Evacuation for Suburban Trains: Part II, Evacuation", ICFD12, 2017.
3. K. Albis, M. Radhwi and A. AbdelGawad "Fire Dynamic Simulation and Evacuation for a Large Shopping Centre (Mall): Part I, Fire Simulation Scenarios", American Journal of Energy Engineering, 3(4-1), pp. 52-71, 2015
4.

Experience:

1.
2.
3.
4.

Training Programs:

1.
2.
3.
4.

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Prof. Dr. Adel Mohamed Abdel Dayem**	
Degree:	**Doctor of Engineering**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Energy Engineering**	**Technical University of Munich, Germany**	**1998**
M.Sc.	**Energy Engineering**	**Cairo University, Egypt**	**1995**
B.Sc.	**Mechanical Engineering**	**Cairo University, Egypt**	**1990**

Employment:

Position	Employer	Period
Professor	**Umm Al-Qura University and Helwan University**	**2015-Present**
Assoc. Professor	**Umm Al-Qura University**	**2008-2015**
Assoc. Professor	**Helwan University, Egypt**	**2003-2008**
Assist. Professor	**City of Scientific Research, Egypt**	**1998-2003**
PhD student	**Technical University of Munich, Germany**	**1995-1998**
Teaching Assistant	**National Research Center**	**1990-1995**

Supported research and development projects related to specialization:

Date	Project title	Amount of funding
2010-2012	Excellent Energy Research Institute, "Study of an integrated solar combined cycle system (ISCCS) for power generation in Saudi Arabia" , KFPM, KSA	About 700000 SR
2014-2015	Ministry of Financial Affairs, " Evaluation of the evaporative air-conditionings in Mena district", Makkah, KSA	About 900000 SR

Patents and Copyright:

Title	Date
Adel M. A. Abdeen, "DESALINATION SYSTEM," Publication number: 20140238839, 2014.	2014
Adel M. A. Abdeen, "SOLAR-POWERED DESALINATION SYSTEM," Patent number: 9150429.	2015

Publications (published papers and books):

Adel M. Abdel Dayem, " HD Solar Water Desalination - A General Prospect", Desalination Research Progress, pp. 317-327, ISBN: 978-1-60456-567-6

1. A. M. Abdel-Dayem and M. Fatouh, " Experimental and numerical investigation of Humidification/dehumidification solar water desalination systems", Desalination, Volume 251, (January 2010) 1-16.
2. H. H. El-Ghetany and A.M. Abdel Dayem, "Numerical and experimental validation of a controlled flow solar water disinfection system ",Water Treatment and Desalination Journal (WTD), Vol. 20 (August, 2010)
3. A. M. Abdel-Dayem, "A Pioneer Solar Water Desalination System: Experimental Testing and Numerical Simulation", Energy Science and Technology Journal, Vol. 1, No. 1, 2011 PP: 33-48, ISSN 1923-8460.
4. H.H. El-Ghetany, A.M. Abdel Dayem, G.E. El-Taweel, M.M. Kamel, "Thermal Performance and Biological Evaluation of Solar Water Disinfection Systems Using Parabolic Trough Collectors", Desalination and Water Treatment Journal (DWT), Vol. 36, 2011.
5. A. M. Abdel-Dayem, "Numerical-Simulation and Experimental-Validation of the Largest Egyptian Solar Process-Heat System", Renewable and Sustainable Energy Journal, Vol. 3, Issue 2, 2011.
6. A. A. Mostafa, M. F. Sedrak, Adel M. Abdel Dayem, " Performance of a Solar Chimney under Egyptian Weather Conditions: Numerical Simulation and Experimental Validation ", Energy Science and Technology Journal, Vol. 1, No. 1, 2011 PP. 49-63, ISSN 1923-8460.
7. Adel M. Abdel Dayem, "Set-up and performance investigation of an innovative solar vehicle", Journal of Renewable and Sustainable Energy 4, 033109 (2012).

8. Adel M. Abdel Dayem, "New solar desalination system using humidification/dehumidification process", International Journal of Energy and Environment, Volume 4, Issue 4, 2013.

9. Adel M. Abdel Dayem, "Efficient solar desalination system using humidification/dehumidification process", J. Sol. Energy Eng. 36, 4 (2014) Paper No: SOL-12-1034; doi:10.1115/1.4027725

10. A.M. Abdel Dayem, M. Nabil Metwally, A. S. Alghamdi, E. M. Marzouk, "Numerical Simulation and Experimental Validation of Integrated Solar Combined Power Plant", Energy Procedia, 12(2014) PP. 290-305

11. Adel M. Abdel Dayem and Abdulmajeed S. Alghamdi, "Transient Performance of Direct Steam Generation Solar Power Plants", International Journal of Energy Research, DOI:10.1002/er.3693.

12. M. A. Mohamad, H. H. EL-Ghetany, Adel M. Abdel-Dayem, "Design, Construction and Field Test of Hot-Box Solar Cookers for African Sahel Region", Renewable Energy Journal, Vol. 14, Nos. 1-4, pp. 49-54, 1998.

13. Adel M. Abdel-Dayem, R. Meyer-Pittroff, W. Russ, M. A. Mohamad, " How To Select A Collector", Applied Energy Journal, 64 (1-4), 1999, pp. 159-164.

14. Adel. M. Abdel-Dayem, M. A. Mohamad, "Potential of Solar Energy Utilization in Textile Industry - Case Study", Renewable Energy Journal, Vol. 23, Nos. 3-4, pp. 685-694 2001.

15. A. M. Abdel-Dayem, H. Shalaby, "Numerical Simulation of Salt Gradient Solar Ponds", International Journal of Computational Methods in Engineering Science and Mechanics (IJCES), Vol. 5, No. 3, 2004, PP.: 673-679.

16. A. M. Abdel-Dayem, N. N. Bayomi, " Experimental and numerical flow visualization of a single square cylinder", International Journal of Computational Methods in Engineering Science and Mechanics, IJCES 040303, 7(2), 2005.

17. A. M. Abdel-Dayem, " Experimental and numerical performance of a multi-effect condensation-evaporation solar water distillation system", Energy Journal 31(2006) 2374-2391.

Experience:

5. **Reviewer in many international journals such as:**
   - Energy (Elsevier).
   - Desalination (Elsevier).
   - Solar Energy Engineering (ASME).

- Member of Steering Committee, ABET Accreditation, Mechanical Engineering Department
- Consultant of Engineering and Strategic Studies

Training Programs:

- Heat exchanger design and theory
- Energy conservation in industry and buildings
- Water distillation and treatment
- Hydraulic systems, pumps, pipes, filters, control valves,…etc
- Maintenance Planning
- Technical report writing
- Solar energy and renewable energy courses

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Hamdy Mahmoud Mohamed Youssef**
Degree:	**Professor**

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Applied Mathematics**	**Alexandria University**	**2003**
M.Sc.	**Applied Mathematics**	**Alexandria University**	**1997**
B.Sc.	**Applied**	**Alexandria University**	**1992**

Employment:

Position	Employer	Period
Professor	**Umm Al-Qura University**	**2012-2018**
Associate Professor	**Umm Al-Qura University**	**2008-2012**
Assistant Professor	**Umm Al-Qura University**	**2004-2008**
Assistant Professor	**Alexandria University**	**2003-2004**
Lecturer	**Alexandria University**	**1994-2003**

Supported research and development projects related to specialization:

Date	Project title	Amount of funding
2012	**Thermoelastic Waves in Gold Nano-Beams Induced by Laser Pulse**	**642000**
2013	**Fractional order thermoelasticity of elastic material with variable thermal conductivity**	**54000**

Patents and Copyright:

Title	Date

Publications (published papers and books):

1- H. M. Youssef, Vibration of Gold Nano-Beam with Variable Thermal Conductivity – State Space Approach, J. Applied Nanoscience, DOI: 10.1007/s13204-012-0158-9, 2013.

2- H. M. Youssef, State-Space Approach to Fractional Order Two-Temperature Generalized Thermoelastic Medium Subjected to Moving Heat Source, Mechanics of Advanced Materials and Structures, vol. 20, pp. 47–60, 2013.

3- E. Bassiouny and H. M. Youssef, Thermo-Elastic Properties of Thin Ceramic Layers Subjected to Thermal Loadings, Journal of Thermoelasticity, vol. 1(1), pp. 4-12, 2013.

4- Ibrahim A. Abbas and H. M. Youssef, Two-Temperature Generalized Thermoelasticity under Ramp-Type Heating by Finite Element Method, Meccanica, vol. 48, 2, pp.331-339, 2013.

5- M. A. Ezzat and H. M Youssef, A Thermal and Thermal Stress Analysis in Thermoelectric Solid under the Influence of Thomson Effect, Journal of Thermoelasticity, vol.1(2), pp. 4-12, 2013.

6- H. M. Youssef, State-Space Approach to Two-Temperature Generalized Thermoelasticity without Energy Dissipation of Medium Subjected to Moving Heat Source, Journal of Applied Mathematics and Mechanics, vol. 34(1), pp.1–10, 2013.

7- H. M. Youssef, Variational Principal of Two-Temperature Thermoelasticity without Energy Dissipation, Journal of Thermoelasticity, vol. 1(1), pp.42-44, 2013.
8- H. M. Youssef, Two-Temperature Generalized Thermoelastic Infinite Medium with Cylindrical Cavity Subjected to Non-Gaussian Laser Beam, Journal of Thermoelasticity, vol. 1(2), pp.19-23, 2013.
9- M. A. Ezzat and H. M. Youssef, Three-Dimensional Problem of Two-Temperature Generalized Thermoelastic Half-Space Subjected to Ramp-Type Heating, Mechanics of Advanced Materials and Structures, vol. 20, pp. 47-60, 2013.
10- H. M. Youssef, Wave Propagation in the Two-Temperature Theory of Thermoelasticity, Encyclopedia of Thermal Stresses, pp. 6492-6495, 2014.
11- M. A. Ezzat and H. M. Youssef, Generalized Magneto-Thermoelasticity for An Infinite Perfect Conducting Body With A Cylindrical Cavity, Materials Physics and Mechanics, vol. 18, pp.156-170, 2013.
12- Essam Bassiouny, Refaat Sabry and Hamdy Youssef, Two Temperature Heat Flux of Semi Infinite Piezoelectric Ceramic Rod, Engineering, vol. 5, pp. 277-291, 2013.
13- M. A. Ezzat and H. M. Youssef, Thermoelectric Figure-of-Merit Effects on Fluid Flow, Materials Physics and Mechanics, vol. 19, pp. 39-50, 2014.
14- M. A. Ezzat and H. M. Youssef, Two-Temperature Theory in Three-Dimensional Problem for Thermoelastic Half Space Subjected to Ramp Type Heating, Mechanics of Advanced Materials and Structures, vol. 21, 293–304, 2014.
15- H. M. Youssef, K. A. Elsibai and A. A. El-Bary, Vibration of Cylindrical Gold Nano-Beam with Fractional Order Thermoelastic Waves, Jökull Journal, vol. 64(6), 416-427, 2014.
16- H. M. Youssef, E. A. N. Al-Lehaibi, Thermoelasticity of Cylindrical Nano-Beam Exited by Ramp-Type Heating, Jökull Journal, vol. 64(6), 74-85, 2014.
17- H. M. Youssef, K. A. Elsibai and A. A. El-Bary, Vibration of Gold Nano Beam in Context of Two-Temperature Generalized Thermoelasticity Subjected to Laser Pulse, Latin American Journal of Solids and Structures, vol. 11, 2460-2482, 2014.
18- H. M. Youssef and A. A. El-Bary, Thermoelastic Material Response Due to Laser Pulse Heating in Context of Four Theorems of Thermoelasticity, Journal of Thermal Stresses, 37: 1379–1389, 2014.
19- H. M. Youssef and I. A. Abbas Fractional order generalized thermoelasticity with variable thermal conductivity, Journal of Vibroengineering JVE, 16(8), 2014.
20- H. M. Youssef, E. A. N. Al-Lehaibi, Two-Temperature Generalized Thermoelastic Infinite Medium with Cylindrical Cavity Subjected to Time Exponentially Decaying Laser Pulse, SYLWAN, 158(10), 64-88, 2014.
21- H. M. Youssef, K. A. Elsibai, On Theory of Two-Temperature Thermoelasticity without Energy Dissipation of Green-Naghdi Model, Applicable Analysis, 94(10), 1997–2010, 2015.
22- M. A. Ezzat and H. M. Youssef, Three-Dimensional Thermo-Viscoelastic Material, Mechanics of Advanced Materials and Structures, 23(1), 108-116, 2015.
23- H. M. Youssef and N. A. Alghamdi, Thermoelastic Damping in Nanomechanical Resonators Based, on Two-Temperature Generalized Thermoelasticity Theory, Journal of Thermal Stresses, 38, 1347–1361, 2015.
24- H. M. Youssef and I. A. Abbas, Two-dimensional fractional order generalized thermoelastic porous material, Latin American Journal of Solids and Structures, 12, 1415-1431, 2015.
25- Eman A. N. Al-Lehaibi, Hamdy M. Youssef, Vibration of Gold Nano-Beam with Variable Young's Modulus Due to Thermal Shock, World Journal of Nano Science and Engineering, 5, 194-203, 2015.

26- H. M. Youssef, K. A. Elsibai and A. A. El-Bary, Vibration of Gold Nano-Beam with Variable Thermal Conductivity Subjected to Sinusoidal Heating, Journal of Engineering Thermophysics, Journal of Computational and Theoretical Nanoscience, 12, pp. 5407-5411(5), 2015

27- H. M. Youssef and A. A. El-Bary, Two-Temperature Generalized Thermo-Elastic Medium Thermally Excited by Time Exponentially Decaying Laser Pulse, International Journal for Structural Stability and Dynamics, 16(1), 2016.

28- Eman A. N. Al-Lehaibi and Hamdy M. Youssef, State-Space Approach to Nano-Beam with Variable Material Properties, Advanced Science, Engineering and Medicine, 8, 1–9, 2016.

29- H. M. Youssef, K. A. Elsibai and A. A. El-Bary, Effect of the Speed, the Rotation and the Magnetic Field on the Q-Factor of an Axially Clamped Gold Nano-Beam, Meccanica, DOI 10.1007/s11012-016-0498-8, 2016.

30- H. M. Youssef, Theory of Generalized Thermoelasticity with Fractional Order Strain, Journal of Vibration and Control, vol. 22, 18: pp. 3840-3857., 2016.

31- M. A. H. Ismail, A. K. Khamis, A. A. El‑Bary and H. M. Youssef, Effect of the rotation of generalized thermoelastic layer subjectedto harmonic heat: state‑space approach, Microsyst Techno, DOI 10.1007/s00542-016-3137-3, 2016.

32- E. Bassiouny, Zeinab Abouelnaga, Hamdy M. Youssef, A One - Dimensional Thermoelastic Problem due to Laser Pulse under Fractional Order Equation of Motion, Canadian Journal of Physics, 95(5): 464-471 1, 2017.

33- A. K. Khamis1, M. A. H. Ismail1, Hamdy M. Youssef and A. A. El‑Bary, Thermal shock problem of two‑temperature generalized thermoelasticity without energy dissipation with rotation, Microsyst Technol, Microsyst Technology 23:4831–4839, 2017.

34- N. A. Alghamdi and H. M. Youssef, Stress-Dependent in Micro-Mechanical Resonators Based On Dual-Phase-Lagging Heat Conduction, Accepted, the scientific Journal Fluid Dynamics and Materials Processing, accepted under press, 2017.

35- Najat A. Alghamdi and Hamdy M. Youssef, Dual-phase-lagging thermoelastic damping in-extensional vibration of rotating nano-ring, Microsystem Technologies; 23(10):4333-43, 2017.

36- H. M. Youssef and A. A. El-Bary, The reference temperature dependence of Young's modulus of two-temperature thermoelastic damping of gold nano-beam, Mechanics Time-Dependent Material, DOI 10.1007/s11043-017-9365-9.

37- M. M. Amin, A. A. El‑Bary and Hamdy M. Youssef, Two‑dimensional problem of generalized thermoelastic half‑space subjected to moving heat source, Microsyst Technology, 23:4611–4617 2017.

38- Hamdy M. Youssef & Eman A. N. Al-Lehaibi, State-space approach to three-dimensionalgeneralized thermoelasticity with fractional order strain, DOI: 10.1080/15376494.2018.1430270, 2018.

39- E. Bassiouny and Hamdy M. Youssef, Sandwich structure panel subjected to thermal loading using fractional order equation of motion and moving heat source, Can. J. Phys. 96: 174–182, 2018.

40- Hamdy M. Youssef and A. A. El‑Bary, Two-Temperature Thermoelastic Damping of A Gold Nano-Beam Resonator with Variable Young's Modulus, International Journal of Acoustics and Vibration, accepted, 2018.

41- Hamdy M. Youssef and Ibrahim A. Abbas, Non-Linear Generalized Thermoelasticity of Temperature Dependent Materials Properties, Heat Transfer Research, accepted, DOI: 10.1615/HeatTransRes.2018025673, 2018.

42- A. K. Khamis, A. A. El-Bary, Hamdy M. Youssef, and Amir Mohamed Abdel Allah Nasr, A Two Dimensional Random Model in the Theory of Generalized Thermoviscoelasticty for a Thick Plate Subjected to Stochastic Ramp-Type Heating, Journal of Advanced Physics Vol. 7, pp. 1–12, 2018.

43- Hamdy M. Youssef and Eman A. N. Al-Lehaibi, Three-dimensional generalized thermoelastic diffusion and application for a thermoelastic half-space subjected to rectangular thermal pulse, Journal of Thermal Stresses, VOL. 41, NO. 8, 1008–1021, 2018.

44- Alaa A. El-Bary, Hamdy M. Youssef, M. A. Omar and Khaled T. Ramadan, Influence of thermal wave emitted by the cellular devices on the human head, Microsystem Technologies, https://doi.org/10.1007/s00542-018-4012-1, 2018.

45- Hamdy M. Youssef and Alaa A. El-Bary, The reference temperature dependence of Young's modulus of two-temperature thermoelastic damping of gold nano-beam, Mech Time-Depend Mater, DOI 10.1007/s11043-017-9365-9, 2018.

46- Hamdy M. Youssef and Alaa A. El-Bary, High-Order Effect in Two-Temperature Thermal Lagging to Thermal Responses in Biological Tissue Subjected to Laser Irradiation, Journal of Biomaterials and Tissue Engineering, accepted, 2018.

47- Hamdy M. Youssef and Alaa A. El-Bary, Theory of Hyperbolic Two-Temperature Generalized Thermoelasticity, Journal of Materials Physics and Mechanics, accepted, 2018.

48- Hamdy M. Youssef and Nehal T. Mansour, Mathematical Model of Two-Temperature Generalized Thermoelastic Diffusion, Materials Focus, Vol. 7, pp. 1–7, 2018.

49- Hamdy M. Youssef, Khaled A. Elsibai, A. A. El-Bary, Vibration of Gold Nano-Beam with Variable Thermal Conductivity Subjected to Sinusoidal Heating, WSEAS / NAUN International Conferences Milan, Italy, January 9-11, 2013.

50- Hamdy M. Youssef, K. A. Elsibai and A. A. El-Bary, Fractional Order Thermoelastic Waves of Cylindrical Nano-Beam, ASME 2013 International Mechanical Engineering Congress & Exposition, November 15-21, San Diego, CA, USA, 2013.

51- Hamdy M. Youssef, E. Allehaibi, Two-temperature generalized thermoelasticity without energy dissipation of infinite medium with spherical cavity thermally excited by time exponentially decaying laser pulse, 9th European Solid Mechanics Conference (ESMC 2015) July 6 - 10, Leganés-Madrid, Spain, 2015.

52- Hamdy M. Youssef, E. Allehaibi, vibration of gold nano-beam with variable young's modulus, ICSV22, Florence, Italy, 12-16 July, 2015.

53- Hamdy M. Youssef, E. Allehaibi, Nano-Resonator with Variable Material Properties, the 1st Thermal and Fluid Engineering Summer Conference, TFESC, August 9-12, New York City, USA, 2015.

54- Hamdy M. Youssef and N. A. Alghamdi, Stress-Dependent in Micro-Mechanical Resonators Based On Dual-Phase-Lagging Heat Conduction, 9th International Conference on Thermal Engineering: Theory and Application March 24-26Abu Dhabi, UAE, 2016.

55- Hamdy M. Youssef and A. A. El-Bary, Y-Index, International Conference of Informatics and Arab Impact Factor, 6-9 August, Alexandria, Egypt, 2016.

56- Hamdy M. Youssef and N. A. Alghamdi, Vibration of Gold Nano Beam in Context of Two-Temperature Generalized Thermoelasticity without energy dissipation,10th International Conference on Thermal Engineering: Theory and Application, February 26-28, 2017 Muscat, Oman

57- Hamdy M. Youssef and N. A. Alghamdi, Nonlinear Behavior And Thermal Damage Of Thermal Lagging In Concentric Living Tissues Subjected To Gaussian Distribution Source, 4th International Conference on Science, Engineering & Environment (SEE), Nagoya, Japan, Nov.12-14, 2018.

58- Hamdy M. Youssef, Eman A. Al-Lehaibi, Adomian's Decomposition Method to Generalized Magneto-Thermoelasticity, 21th International Conference on Applied Mathematics and Scientific Computing to be held in Rome, Italy during January, 17-18, 2019.

59- Hamdy M. Youssef and Alaa A. El-Bary, Numerical Solution of One Dimensional Generalized Thermoelastic Problem by Using Adomian's Decomposition Method and Laplace's Transform Method. The 28th International Conference on Computer Theory and Applications (ICCTA 2018), EGYPT.

Experience:
6. **Teaching and Researching in Alexandria University form 1994-2004**
7. **Teaching and Researching in Umm Al-Qura University form 2004-2018**
8. **Editor in 2 Scientific Journals and reviewers in many international journals**
9.

Training Programs:
5. **Mathematical Summer Courses in Perugia, ITALY, 2001**
6. **ICDL (International Computer Driving License) UNESCO, 2004**
7. **PMP (Project Management Institute PMI) 2017**

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Hamdy Mahmoud Mohamed Youssef**	
Degree:	**Professor**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Applied Mathematics**	**Alexandria University**	**2003**
M.Sc.	**Applied Mathematics**	**Alexandria University**	**1997**
B.Sc.	**Applied**	**Alexandria University**	**1992**

Employment:

Position	Employer	Period
Professor	**Umm Al-Qura University**	**2012-2018**
Associate Professor	**Umm Al-Qura University**	**2008-2012**
Assistant Professor	**Umm Al-Qura University**	**2004-2008**
Assistant Professor	**Alexandria University**	**2003-2004**
Lecturer	**Alexandria University**	**1994-2003**

Supported research and development projects related to specialization:

Date	Project title	Amount of funding
2012	**Thermoelastic Waves in Gold Nano-Beams Induced by Laser Pulse**	**642000**
2013	**Fractional order thermoelasticity of elastic material with variable thermal conductivity**	**54000**

Patents and Copyright:

Title	Date

Publications (published papers and books):

60- H. M. Youssef, Vibration of Gold Nano-Beam with Variable Thermal Conductivity – State Space Approach, J. Applied Nanoscience, DOI: 10.1007/s13204-012-0158-9, 2013.

61- H. M. Youssef, State-Space Approach to Fractional Order Two-Temperature Generalized Thermoelastic Medium Subjected to Moving Heat Source, Mechanics of Advanced Materials and Structures, vol. 20, pp. 47–60, 2013.

62- E. Bassiouny and H. M. Youssef, Thermo-Elastic Properties of Thin Ceramic Layers Subjected to Thermal Loadings, Journal of Thermoelasticity, vol. 1(1), pp. 4-12, 2013.

63- Ibrahim A. Abbas and H. M. Youssef, Two-Temperature Generalized Thermoelasticity under Ramp-Type Heating by Finite Element Method, Meccanica, vol. 48, 2, pp.331-339, 2013.

64- M. A. Ezzat and H. M Youssef, A Thermal and Thermal Stress Analysis in Thermoelectric Solid under the Influence of Thomson Effect, Journal of Thermoelasticity, vol.1(2), pp. 4-12, 2013.

65- H. M. Youssef, State-Space Approach to Two-Temperature Generalized Thermoelasticity without Energy Dissipation of Medium Subjected to Moving Heat Source, Journal of Applied Mathematics and Mechanics, vol. 34(1), pp.1–10, 2013.

66- H. M. Youssef, Variational Principal of Two-Temperature Thermoelasticity without Energy Dissipation, Journal of Thermoelasticity, vol. 1(1), pp.42-44, 2013.

67- H. M. Youssef, Two-Temperature Generalized Thermoelastic Infinite Medium with Cylindrical Cavity Subjected to Non-Gaussian Laser Beam, Journal of Thermoelasticity, vol. 1(2), pp.19-23, 2013.

68- M. A. Ezzat and H. M. Youssef, Three-Dimensional Problem of Two-Temperature Generalized Thermoelastic Half-Space Subjected to Ramp-Type Heating, Mechanics of Advanced Materials and Structures, vol. 20, pp. 47-60, 2013.

69- H. M. Youssef, Wave Propagation in the Two-Temperature Theory of Thermoelasticity, Encyclopedia of Thermal Stresses, pp. 6492-6495, 2014.

70- M. A. Ezzat and H. M. Youssef, Generalized Magneto-Thermoelasticity for An Infinite Perfect Conducting Body With A Cylindrical Cavity, Materials Physics and Mechanics, vol. 18, pp.156-170, 2013.

71- Essam Bassiouny, Refaat Sabry and Hamdy Youssef, Two Temperature Heat Flux of Semi Infinite Piezoelectric Ceramic Rod, Engineering, vol. 5, pp. 277-291, 2013.

72- M. A. Ezzat and H. M. Youssef, Thermoelectric Figure-of-Merit Effects on Fluid Flow, Materials Physics and Mechanics, vol. 19, pp. 39-50, 2014.

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110- Hamdy M. Youssef, E. Allehaibi, Two-temperature generalized thermoelasticity without energy dissipation of infinite medium with spherical cavity thermally excited by time exponentially decaying laser pulse, 9th European Solid Mechanics Conference (ESMC 2015) July 6 - 10, Leganés-Madrid, Spain, 2015.

111- Hamdy M. Youssef, E. Allehaibi, vibration of gold nano-beam with variable young's modulus, ICSV22, Florence, Italy, 12-16 July, 2015.

112- Hamdy M. Youssef, E. Allehaibi, Nano-Resonator with Variable Material Properties, the 1st Thermal and Fluid Engineering Summer Conference, TFESC, August 9-12, New York City, USA, 2015.

113- Hamdy M. Youssef and N. A. Alghamdi, Stress-Dependent in Micro-Mechanical Resonators Based On Dual-Phase-Lagging Heat Conduction, 9th International Conference on Thermal Engineering: Theory and Application March 24-26Abu Dhabi, UAE, 2016.

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115- Hamdy M. Youssef and N. A. Alghamdi, Vibration of Gold Nano Beam in Context of Two-Temperature Generalized Thermoelasticity without energy dissipation,10th International Conference on Thermal Engineering: Theory and Application, February 26-28, 2017 Muscat, Oman

116- Hamdy M. Youssef and N. A. Alghamdi, Nonlinear Behavior And Thermal Damage Of Thermal Lagging In Concentric Living Tissues Subjected To Gaussian Distribution Source, 4th International Conference on Science, Engineering & Environment (SEE), Nagoya, Japan, Nov.12-14, 2018.

117- Hamdy M. Youssef, Eman A. Al-Lehaibi, Adomian's Decomposition Method to Generalized Magneto-Thermoelasticity, 21th International Conference on Applied Mathematics and Scientific Computing to be held in Rome, Italy during January, 17-18, 2019.

118- Hamdy M. Youssef and Alaa A. El-Bary, Numerical Solution of One Dimensional Generalized Thermoelastic Problem by Using Adomian's Decomposition Method and Laplace's Transform Method. The 28th International Conference on Computer Theory and Applications (ICCTA 2018), EGYPT.

Experience:

10. **Teaching and Researching in Alexandria University form 1994-2004**
11. **Teaching and Researching in Umm Al-Qura University form 2004-2018**
12. **Editor in 2 Scientific Journals and reviewers in many international journals**
13.

Training Programs:

8. **Mathematical Summer Courses in Perugia, ITALY, 2001**
9. **ICDL (International Computer Driving License) UNESCO, 2004**
10. **PMP (Project Management Institute PMI) 2017**

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Abdulmannan Abdulhamied Safder Ali Saati**	
Degree:	**Ph.D.**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Aero Space Eng. Sic.**	**CU (USA)**	**1991**
M.Sc.	**Mech. Engineering**	**CU (USA)**	**1986**
B.Sc.	**Mech. Engineering**	**UKFPM (Saudi Arabia)**	**1979**

Employment:

Position	Employer	Period
Associate Prof.	**Umm Al-Qura University**	**Jun. 2006 --------**
Assist. Prof.	**Umm Al-Qura University**	**Jul. 1992 – Jun. 2006**
TA	**Umm Al-Qura University**	**Nov. 1982 – Jul. 1992**
Aircraft Engineer (Power Plant)	**Saudi Airline**	**Sep.1979 – Nov. 1982**

Supported research and development projects related to specialization:

Date	Project title	Amount of funding
1999-2000	A Diagnostic Study for the Automatic Extinguisher System in Mina"	**100000**

Patents and Copyright:

Title	Date

Publications (published papers and books):

Bawazeer, S., Mohamad, A. and Saati, A., " Modeling of Natural Convection in Desert with Different Albedo", Journal 7th International Conference on Computational Heat and Mass Transfer, (ICCHMT), 19-21Aug. **2011**.

Saati, A. and Bawazeer, S.A., "Natural Convection in Cavities with a Thin Fin on the Hot Wall Using the Lattice Boltzmann Method", Tenth International Congress of Fluid Dynamics (ICFD10), 16-19 Dec. **2010**.

Saati, A. and Mohamad, A.A., "Heat Transfer Enhancement in a composite parallel plate channel: Utilizing the $k-\varepsilon$ Low-Reynolds-Number Model" Journal of Porous Media, Vol. 10(3): 249-259, **2007**.

Saati, A. and Mohamad, A.A. "Heat Transfer Enhancement in Channel Filled Partially with Porous Medium Including Thermal Conductivity Effects" Proceedings of the 5th International Conference on Computational Heat and Mass Transfer, June 18-22, **2007**, Canmor, Canada.

Saati, A.A. "Force Convection in Channel Filled Partially with Porous Medium Including the Effects of Thermal Conductivity" Proceedings of the 8th International Congress of Fluid Dynamics and Propulsion, December 14-17, **2006**, Sharm El-Shiekh, Sinai, Egypt.

Saati, A.A. "A Numerical Investigation of Ground Heat Transfer to the Building: Including Edge Insulation and Composite Slab Effects" Umm Al-Qura University Journal Science-Medicine-Engineering, Vol. 18, No. 1 January **2006**

Saati, A.A. "Numerical investigation of Turbulent Natural Convection in Enclosures with Different Aspect Ratio" Engineering research Journal Ainshams University, V40(3), September 30, **2005**.

. Saati, A.A. "Turbulent Flow and Heat Transfer in a channel occupied by a porous: Utilizing low Reynolds number $k-\varepsilon$ model" Engineering research Journal Ainshams University, Vol. 40(3) September **2005**.

Saati, A. and Mohamad, A.A. " Turbulent Nutural Convection in Enclosures" Proceedings of the 2nd International Conference on Thermal Engineering Theory and Applications, January 3-6, **2006**, Al Ain, United Arab Enirates.
A Diagnostic Study for the Automatic Extinguisher System in Mina", Fakieh Research and Development Center. By Saati, A. A., Abdulsalam, M. and Gaze, M. (2000).
Saati, A.A. "Numerical Study of Soil Properties on Heat Transfer Between Soil and Cold Storage" Umm Al-Qura University Journal Science-Medicine-Engineering, 17(1): 75-91 **2005**.
M.A.Shhien and A.A.Saati "Combustion and Heat Transfer Studies in a Tangentially Fired Model Furnace" Eng. Res. Journal. Faculty of Engineering, Material, Helwan University, Cairo, Vol.95 Oct. **2004**.
Thermodynamic Quick Reference, Zamot, M. / Saati, A., 2003
M.A.Shhien and A.A.Saati "An Investigation on Combustion and Heat Transfer in a Tangentially Fired Model Furnace" Eng. Res. Journal. Faculty of Engineering, Material, Helwan University, Cairo, Vol.90 Dec. **2003**.
Edrees M. and Saati, A. A. " A Mechanical and Architectural Alternatives for the Ventilation in the Basement of the Holy Mosque (The First Saudi Expansions)", The Custodian of the Holy Mosques Institute of Hajj Research, **2003**.
Saati, A. A. and Shahien, M. "A Developmental Study for the Evaporative Air Conditioning System by Using the Solar Energy in Mina", The Custodian of the Holy Mosques Institute of Hajj Research, **2002**.
Saati, A. A. and Shhien, M. "Experimental Study on Reducing the Air and Noise Pollution in the Tunnels Region in Makkah", The Custodian of the Holy Mosques Institute of Hajj Research, **2001**.
Saati, A. A., Abdulsalam, M. and Gaze, M. "An Evaluation Study for Safety against Dangers Caused by Ignition" The Custodian of the Holy Mosques Institute of Hajj Research, **1998**.
Danabasoglu, G. Saati, A. and Biringen, S., "Three Dimensional Simulations of Incompressible and Compressible, Flow Stability" Computer Physics Communications. Vol. 65 (**1991**) pp. 76-83.
Saati, A., Biringen, S. and Farhat, C. "Solving Navier-Stokes Equations on a massively parallel processor: Beyond the 1 GFLOP performance" The International Journal of Supercomputer Applications. Vol. 4 No. 1 spring **1990**, pp. 72-80.
Biringen, S. and Saati, A. "Comparison of Several Finite Difference Methods" AIAA Journal, Vol. 27 No. 1 January **1990**, pp 90-92.
Experience:
1. General Director of General Projects & Services of University Campus & Branches, Umm Al-Qura University (2008 to 2009) 2. Vice Dean of Faculty of Engineering and Islamic Arctectur, Umm Al-Qura University, (1999 to 2001). 3. Chairman of Mechanical Engineering Dep., Umm Al-Qura University (1993 to 1999).
Training Programs:
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3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Mohamed Hassan Ahmed Mohamed**	
Degree:	**Associate Professor**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Renewable Energy**	**Otto von Guericke University (OVGU)-Magdeburg in Germany**	**2011**
M.Sc.	**Mechanical power engineering**	**Helwan University**	**2003**
B.Sc.	**Mechanical power engineering**	**Helwan University**	**1997**

Employment:

Position	Employer	Period
Associate Professor	**Umm Al Qura University**	**From 2016 till now**
Assistance Professor	**Umm Al Qura University**	**From 2015 till 2016**
Vistor Professor	**Otto von Guericke University (OVGU)-Magdeburg in Germany**	**From 2013 till 2014**
Assistance Professor	**Helwan University**	**From 2011 till 2013**
PhD Student	**Otto von Guericke University (OVGU)-Magdeburg in Germany**	**From 2007 till 2011**

Publications (published papers and books):

1. I Hashem, HS Abdel Hameed, **MH Mohamed**, An axial turbine in an innovative oscillating water column (OWC) device for sea-wave energy conversion, Ocean Engineering, 164, 536-562, 2018.
2. M Mohammadi, R Mohammadi, A Ramadan, **MH Mohamed**, Numerical Investigation of Performance Refinement of a Drag Wind Rotor Using Flow Augmentation and Momentum Exchange Optimization, Energy, 2018
3. S Shaaban, A Albatal, **MH Mohamed**, Optimization of H-Rotor Darrieus turbines' mutual interaction in staggered arrangements, Renewable Energy 125, 87-99, 2018.
4. A Ramadan, K Yousef, M Said, **MH Mohamed**, Shape Optimization and Experimental Validation of a Drag Vertical Axis Wind Turbine, Energy, 151, 839-853, 2018.
5. M Maizi, **MH Mohamed**, R Dizene, MC Mihoubi, Noise reduction of a horizontal wind turbine using different blade shapes, Renewable Energy 117, 242-256, 2018.
6. Paresh Halder, **Mohamed, M. H.** & Abdus Samad, Wave Energy Conversion: Design and Shape Optimization, ocean Engineering, 150 (2018) 337–351
7. M Mohammadi, M Lakestani, **MH Mohamed**, Intelligent parameter optimization of Savonius rotor using Artificial Neural Network and Genetic Algorithm, Energy 143, 56-68, 2018.
8. I Hashem, **MH Mohamed**, Aerodynamic performance enhancements of H-rotor Darrieus wind turbine, Energy 142, 531-545, 2018.
9. MH Mohamed, AZ El-Sayed, KF Megalla, HF Elattar, Modeling and performance study of a parabolic trough solar power plant using molten salt storage tank in Egypt: effects of plant site location, Energy Systems, 2018, 1-28.
10. A Awwad, **MH Mohamed**, M Fatouh, Study the Effect of Ceiling Air Diffuser Blade and Lip Angles Using CFD, ATHENS JOURNAL OF TECHNOLOGY & ENGINEERING_PUBLICATION, vol.4 (4), 309-359, 2017.
11. **Mohamed, M. H.,** George E. William & M. Fatouh: Solar energy utilization in water production from humid air, **Solar Energy**, 148 (2017) 98–109.
12. Ahmed Awwad, **Mohamed H. Mohamed,** Mohamed Fatouh **,** Optimal Design of a Louver Face Ceiling Diffuser Using CFD to Improve Occupant's Thermal Comfort, **Journal of Building Engineering**, **Volume 11C, 2017, Pages 134-157**.
13. Islam Hashem, **Mohamed H. Mohamed**, Aida A. Hafiz, Aero-acoustics Noise Assessment for Wind-Lens Turbine, **Energy 118 (2017) 345-368.**
14. **Mohamed, M. H**., Reduction of the generated aero-acoustics noise of a vertical axis wind turbine using CFD (Computational Fluid Dynamics) techniques, **Energy,** 96, 531-544**, (2016).**
15. El Baz, A., Youssef, K. & **Mohamed, M. H**., Performance Assessment of an Interactive Three-Rotor Savonius Wind Turbine, **Renewable Energy, 86(2016), 89-98 (2016).**

16. George E. William, **Mohamed, M. H.** & M. Fatouh: Desiccant System for Water Production from Humid Air using Solar Energy, **Energy**, **90 (2015) 1707-1720, (2015).**
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19. **Mohamed, M.H.** & Shapaan, S., Numerical Optimization of axial turbine with Self Pitch Controlled Blades used wave energygy conversion. **J. of Energy Research**, 38(5), 592:601, (2014).
20. Ramadan, A., **Mohamed, M. H.,** M., Yousief, Montasser, O.A., S. M., El Feky, A. and El Baz, A. R. An Artificial Generation of a few specific wave conditions: New Simulator Design and Experimental performance. **Energy**, 69 (6), 309-318, (2014).
21. Ramadan, A., **Mohamed, M. H.,** M., Yousief, S. M., Abdien, S. , El Feky, A. and El Baz, A. R. Analytical Investigation and Experimental Validation of an Inverted Cup Float Used for Wave Energy Conversion. **Energy,** 70 (7), 539-546, (2014).
22. **Mohamed, M.H.,** Impacts of Solidity and Hybrid System for a Small Wind Turbine Performance. **Energy**, *57(8):495-504, (2013).*
23. **Mohamed, M.H.** & Shapaan, S., Optimization of Blade Pitch Angle of an Axial Turbine Used for Wave Energy Conversion. **Energy**, *56(7):229-239, (2013).*
24. **Mohamed, M.H.,** Performance Investigation of H-rotor Darrieus Turbine with New Airfoil Shapes. **Energy**, *47(1):522-530, (2012).*
25. **Mohamed, M.H.,** Janiga, G., Pap, E. and Thévenin, D., Optimal Blade Shape of a Modified Savonius Turbine Using an Obstacle Shielding the Returning Blade. **J. of Energy Conversion and Management**, 52:236-242, (2011).
26. **Mohamed, M.H.,** Janiga, G., Pap, E. and Thévenin, D., Multi-Objective Optimization of the Airfoil Shape of Wells Turbine used for Wave Energy Conversion. **Energy**, 36(1):438-446, (2011).
27. **Mohamed, M.H.,** Janiga, G., Pap, E. and Thévenin, D., Optimization of Savonius turbines using an obstacle shielding the returning blade. **Renewable Energy**, 35(11):2618-2626*, (2010)*.
28. Ramadan, A., **Mohamed, M. H.,**, A NOVEL METHODOLOGY TO EXTRACT RIVER CURRENT ENERGY BY A DRAG TURBINE, Proceedings of the ASME 2018 Power and Energy Conference PowerEnergy-USA-2018
29. Ramadan, A., **Mohamed, M. H.,**, Yousief, S. , El Baz, A. R. and Abd El maksod, M. Power Captured Experimentally from Water Wave using the Wave Hunter System, 4th International Conference and Exhibition on Mechanical & Aerospace Engineering, USA.
30. Islam Hashem, **Mohamed H. Mohamed**, Aida A. Hafiz, Numerical Prediction of Aero-acoustics Emitted From Un-shrouded and Shrouded Wind Turbines, ICFD12, Cairo, 2016.
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33. Daróczy, L., **Mohamed, M.H.** and Thévenin, D.: Numerical aero-acoustics assessment of double-airfoil vertical axis wind turbine. In: *DAGA*, Nürnberg, Germany, 374, 2015.
34. László Daróczy, **Mohamed, M.H.,** Janiga, G. and Thévenin, D.: ANALYSIS OF THE EFFECT OF A SLOTTED FLAP MECHANISM ON THE PERFORMANCE OF AN H-DARRIEUS TURBINE USING CFD. In: ASME Turbo Expo Conference, Düsseldorf, Germany, GT2014-25250, Turbo Expo , accepted for publication, (2014).
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36. Ramadan, A., **Mohamed, M. H.,** Abdien, S. M., Yousief, S. M., El Feky, A. and El Baz, A. R. Numerical and Experimental Assessment of an Inverted Cup Float Used for Wave Energy Conversion. International Conference and Exhibition on Mechanical & Aerospace Engineering, Texas, USA, Sep. 30-Oct. 2, (2013).
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38. George E. William, **Mohamed M. H.** & M. Fatouh: Simulation of a Water Recovery from Atmospheric Air System by Using Solar Energy, Int. Congress of fluid dynamics, ICFD11-EG-4053, December 19-21, 2013, Alexandria, Egypt, (2013).
39. Amgad, M. Ali, **Mohamed, M. H**. & Aida A. Hafiz: Pre- process of ANSYS Workbench and Gambit Meshing Tools for Numerical modeling: H-rotor Darrieus Turbine as a Case Study, Int. Congress of fluid dynamics, ICFD11-EG-4030, December 19-21, 2013, Alexandria, Egypt, (2013).
40. Amgad, M. Ali, **Mohamed, M.H.** & Aida A. Hafiz: Theoretical Investigation of H-rotor Darrieus Turbine Performance with Different Airfoil Shapes, Int. Congress of fluid dynamics, ICFD11-EG-4030, December 19-21, 2013, Alexandria, Egypt (2013).
41. **Mohamed, M.H.,** Janiga, G., and Thévenin, D.: Optimal Design of Savonius turbine. In: Conference on Modelling Fluid Flow (Vad, J., Ed.), Budapest, Hungary, ISBN 978-963-08-4586-1, 55-62, *(2012).*

42. Ramadan,A., **Mohamed, M. H.,** Abdien, S. M. , Yousief, S. M., El FEKY, A. and El Baz, A. R. Design and Performance of an Artificial Regular and Irregular Sea wave Simulator, 1st Asian Wave and Tidal Conference Series, , *(2012).*
43. **Mohamed, M.H.,** and Thévenin, D.: Performance optimization of a Savonius Turbine Considering Differerent Shapes for Frontal Guiding Plates. In: 10th Int. Congress of Fluid Dynamics ASME-ICFD10, EG-3026, Cairo, Egypt, *(2010).*
44. **Mohamed, M.H.,** Janiga, G., Pap, E. and Thévenin, D.: Optimal performance of a modified three-blade Savonius turbine using frontal guiding plates. In: ASME Turbo Expo Conference, Glasgow, Scotland, GT2010-22538, Turbo Expo 5, 803-812, *(2010).*
45. **Mohamed, M.H.,** Janiga, G. and Thévenin, D.: Airfoil shape optimization of a two-stage Wells turbine. In: microCAD10 International Scientific Conference, (Bikfalvi, P., Ed.), Miskolc, Hungary, ISBN 978-963-661-910-7, 51-56, *(2010).*
46. **Mohamed, M.H.,** Janiga, G. and Thévenin, D.: Airfoil shape optimization of a two-stage Wells turbine. In: microCAD10 International Scientific Conference, (Bikfalvi, P., Ed.), Miskolc, Hungary, ISBN 978-963-661-924-4, 99-104*, (2010).*
47. **Mohamed, M.H.,** Janiga, G., Pap, E. and Thévenin, D.: Optimal performance of a Savonius turbine using guiding plates. In: Conference on Modelling Fluid Flow (Vad, J., Ed.), Budapest, Hungary, ISBN 978-963-420-987-4, 871-878, (2009).
48. **Mohamed, M.H.,** Janiga, G., Pap, E. and Thévenin, D.: Optimal shape of a modified Wells turbine considering mutual interaction between the blades. In: First International Conference of Energy Engineering ICEE-1, Aswan, Egypt, (2008).
49. **Mohamed, M.H.,** Janiga, G., Pap, E. and Thévenin, D.: Optimal performance of a Savonius turbine using an obstacle shielding the returning blade. In: 9th Int. Congress of Fluid Dynamics and Propulsion ASME-ICFDP9, Alexandria, Egypt, 249/1-249/9, (2008).
50. **Mohamed, M.H.,** Janiga, G. and Thévenin, D.: Performance optimization of a modified Wells turbine using non-symmetric airfoil blades. In: ASME Turbo Expo Conference, Berlin, Germany, GT2008-50815, Turbo Expo 6 (PART C), 2481-2488, (2008).
51. H. Heikal, A. El–Hafiz, N. N. Bayomi & **M.H. Mohamed,** ''Theoretical and Experimental Investigation on the Wells Turbine Performance'', In: 7th International Conference on Theoretical & Applied Mechanics, Cairo, Egypt, (2003).

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Dhia K. Suker**
Degree:	**PhD**

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Mechanics of Materials**	**University of Sheffield, UK**	**1995**
M.Sc.	**Fracture Mechanics**	**University of Sheffield, UK**	**1991**
B.Sc.	**Mechanical Engineering**	**University of Mosul, Iraq**	**1987**

Employment:

Position	Employer	Period
Associate Professor	**Umm Alqura University**	**7 months**
Assistant Professor	**Umm Alqura University**	**10 years**
Lecturer	**Sheffield University**	**8 years**
Research Associate	**Sheffield University**	**5 years**

Supported research and development projects related to specialization:

Date	Project title	Amount of funding
Sep. 2009-Sep. 2012	**Mathematical modelling of flow stress of Al-Mg alloys during hot deformation**	**106,000.00 SR**
Sep. 2014- Sep. 2017	**Designer Materials: Achieving the materials properties via controlling the deformation conditions**	**2,000.000.00 SR**

Patents and Copyright:

Title	Date

Publications (published papers and books):

5. **D. Suker**, Aluminium Alloys: Survey of the Data in the Literature. International Journal of Materials Engineering and Technology, Volume 9, Number 1, 2013, Pages 1-18.
6. **D. Suker**, Hot Deformation Characterisation of Al-Cu-Mg-Fe-Ni Aluminium Alloy. International Journal of Materials Engineering and Technology, Volume 7, Number 2, 2012, Pages 139-146.
7. D. Suker, Modelling of Al-Cu-Mg-Fe-Ni Aluminium Alloy. Open Journal of Metal, Volume2, Dec. 2012, Pages 79-81.
8. **D.K. Suker** and Y.S. Alqurashi, "An Experimental Investigation of Tool Geometry Influnce on Surface roughness in milling operations", International Journal of Engineering Research and Managment. Volume 2, 2015, pp65
9. **D. K. Suker**, A. Mirza, Influence of Drilling Parameters on Burr Formation and Size for low carbon steel and stainless steel, International Journal of Materials Engineering and Technology, volume 13, Number 2, 2015, pp147-159.
10. Ateyah Alzahrani, **Dhia K. Suker**, Sajid Riaz, "Load Analysis of Knee Joint Replacement During Daily Life Activity for Obese Weight Subjects". International Journal of Engineering Research and Management (IJERM), Volume-03, Issue-03, 2016.
11. **D. K. Suker**, M. S. Alsoufi, M. M. Alhusaini, S. A. Azam, "Studying the Effect of Cutting Conditions in Turning Process on Surface Roughness for Different Materials". *World Journal for Research and Review (WJRR), Volume-02, Issue-04, 201*6.
12. A.H. Backar, **D.K.Suker**, T.A. Elbenawy, H.A. Ghulman, M.W. Al-Hazmi "Optimal hot deformation characterization of AA5083 Aluminium Alloy". International Journal of Mechanical & Mechatronics Engineering IJMME-IJENS, **Vol. 16, No.3.** 2016

13. **D.K.Suker,** T.A. Elbenawy, A.H. Backar H.A. Ghulman, M.W. Al-Hazmi "Hot deformation characterization of AAISI316 and AISI304 Stainless Steel". International Journal of Mechanical & Mechatronics Engineering IJMME-IJENS, **Vol. 17, No.2.** 2017

14. Mohammad S. Alsoufi, **Dhia .K.Suker**, Mohammed W. Al-Hazmi, and Sufyan Azam " Influence of Abrasive WaterJet Machining Parameters on the Surface Texture Quality of Carrara Marble". Journal of Surface Egineered Materials And Advanced Technology JESMAT, **Vol.7, No.2.** PP. 25-37. 2017

Experience:

14. **1994-1998 Working in a research in Fundamental Study in Multiaxial Fatigue Damage Accumulation at Sheffield University, Sponsored by EPSRC.**
15. **1998-2004 Independent research worker, SIRIUS, Sheffield University, Involved in multiaxial fatigue research on various EPSRC, and industrial collaboration.**
16. **2005-2008 Training consultant, Training Centre of Educational Experience, Riyadh, involved in Teachers Competency Test programme**
17. **2003-2006 Member of management committee of London Open College.**
18. **2013 Consultant for the waste management unit in Hajj Research Institute, Umm Al-Qura University**
19. **2009-up to date Head of laboratory committee in Mechanical Engineering Department, UQU.**
20. **2009 up to date A member of steering committee and assessment committee for accreditation and assessment in Mechanical Engineering Department, UQU**

Training Programs:

15. **Active Learning Course. With the coordination of the College of Administrative Science and Tourisms. Umm Al-Qura University, October 2009.**
16. **Designing an Active Course by using Course Lab Program. With the coordination of the National Center for E-Learning and Distance Learning. Umm Al-Qura University 14-15 may 2010.**
17. **Strategic Success in Writing Research Proposals. With the coordination of the King Abdullah University for science and Technology and King Abdulaziz City for science and technology. King Abdulaziz City for science and Technology. 30-31 October 2010.**
18. **Finite element Analysis by using Ansys Workbench Program. With the coordination of the Ansys Incorporation. Mechanical Engineering Department, Umm Al-Qura University 13-17 May 2011.**
19. **Finite element Analysis by using ABAQUS Program. With the coordination of the ABAQUS Incorporation. Mechanical Engineering, 2015.**

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Mohamed El-Sayed El-Ashhab**	
Degree:	**Associate Professor**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Industrial Engineering (SCM)**	**Ain Shams University**	**2008**
M.Sc.	**Industrial Engineering (QC)**	**Ain Shams University**	**2003**
B.Sc.	**Bachelor of Design & Production Engineering**	**Ain Shams University**	**1996**

Employment:

Position	Employer	Period
Associate Professor	**Umm Al-Qura University**	**2018-till now**
Assistant Professor	**Umm Al-Qura University**	**2011-2018**
Assistant Professor	**Ain Shams University**	**2008-till now**
Lecturer	**Ain Shams University**	**2003-2008**
Demonstrator	**Ain Shams University**	**1997-2003**

Supported research and development projects related to specialization:

Date	Project title	Amount of funding

Patents and Copyright:

Title	Date

Publications (published papers and books):

1. M. S. El-Sayed and A. M. Ali. MEASURING OF SYSTEM EFFECTIVENESS: A PREVIEW. Production Engineering & Design for Development, PEDD7, Cairo, February 7 – 9, 2006. PP 414-431
2. El-Sayed, M., Afia, N., & El-Kharbotly, A. (2010). A stochastic model for forward–reverse logistics network design under risk. Computers & Industrial Engineering, 58(3), 423-431.
3. M. S. Al-Ashhab. An Optimization Model for Multi-Period Multi-Product Multi-Objective Production Planning, International Journal of Engineering & Technology IJET-IJENS, Vol: 16 No: 01, February 2016, Pages 43-56.
4. Eyad Talal Serdar, M. S. Al-Ashhab. Supply Chain Network Design Optimization Model for Multi-period Multi-product, International Journal of Mechanical & Mechatronics Engineering IJMME, Volume 16, Issue 1, Feb. 2016, Pages 122-140.
5. M. S. Al-Ashhab. A generic capacitated multi-period, multi-product, integrated forward-reverse logistics network design optimization model, IOSR Journal of Engineering (IOSRJEN), Vol. 06, Issue 05 (May. 2016), [V2] PP 40-56.
6. M. S. Al-Ashhab, Nahid Afia and Lamia A. Shihata. Objective Effect on the Performance of a Multi-Period Multi-Product Production Planning Optimization Model, International Journal of Mechanical & Mechatronics Engineering IJMME, Vol: 16, No: 03, June 2016, Pages 88-100.
7. M. S. Al-Ashhab. Supply Chain Network Design Optimization Model for Multi-period Multi-product under Uncertainty. International Journal of Mechanical Engineering and Applications. Vol. 5, No. 1, 2017, pp. 28-40. doi: 10.11648/j.ijmea.20170501.14
8. Al-Ashhab Mohamed Sayed and, Nahid Afia. An NPV Optimization Model for Closed-Loop Supply Chain Network Design and Planning, American Journal of Engineering and Applied Sciences, 2017, 10 (1): 114.125. DOI: 10.3844/ajeassp.2017.114.125.

9.	M. S. Al-Ashhab, Shadi Munshi, Mowffaq Oreijah, Hamza A. Ghulman. Job Shop Scheduling Using Mixed Integer Programming. International Journal of Modern Engineering Research (IJMER). Volume 7, Issue 3, Mar 2017. Pp. 23-29.
10.	Mohamad Sayed Al-Ashhab, Taiser Attia, Shadi Mohammad Munshi. (2017) Multi-Objective Production Planning Using Lexicographic Procedure. American Journal of Operations Research, 7, 174-186. https://doi.org/10.4236/ajor.2017.73012.
11.	M. S. Al-Ashhab, Sufyan Azam, Shadi Munshi and Tarek M. Abdolkader. "A Multi-Period MPS Optimization Using Linear Programming and Genetic Algorithm with Capacity Constraint." IOSR Journal of Engineering (IOSRJEN), vol. 08, no. 001, 2018, pp. 85–93.
12.	M. S. Al-Ashhab. "Multi-Objective Job Shop Scheduling Using a Lexicographic Procedure". International Journal of Engineering Science Invention (IJESI), vol. 07, no. 01, 2018, pp. 47-56.
13.	M. S. Al-Ashhab, and Hassan Fadag. (2018). "MULTI-PRODUCT MASTER PRODUCTION SCHEDULING OPTIMIZATION MODELLING USING MIXED INTEGER LINEAR PROGRAMMING AND GENETIC ALGORITHMS." International Journal of Research - Granthaalayah, 6(5), 78-92. https://doi.org/10.5281/zenodo.1255237.
14.	M. S. Al-Ashhab and Abdulrahman Alghamdi. (2018) "Two-Stage Multi-Objective University Courses Timetabling Using Genetic Algorithms" International Journal of Engineering and Technology (IJET), Vol 10 no 4, pp. 1102-1111. DOI: 10.21817/ijet/2018/v10i4/181004030.
Experience:	
21.	
22.	
23.	
24.	
Training Programs:	
1.	ISO 9001; 14001; 17020; 17025; 27001; 16949; 29001 and 18001 Awareness
2.	Measurement system analysis
3.	Supply chain management
4.	Control planning
5.	Continual Improvement
6.	Production Planning and Control
7.	Lean Six-Sigma
8.	Maintenance Management
9.	Total Productive Maintenance (TPM)
10.	Project Management

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**IBERAHIN JUSOH**	
Degree:	**MECHANICAL ENGINEERING**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Offshore Structures**	**Heriot-Watt University, United Kingdom**	**1996**
M.Sc.	**Marine Technology**	**Strathclyde University, United Kingdom**	**1989**
B.Sc.	**Mechanical Engineering**	**Liverpool Polytechnic, England. United Kingdom**	**1983**

Professional Affiliation:

Status	Specialization	Institution	Year
CEng *(Chartered Engineer)*	**Engineering Structures**	**Engineering Council, United Kingdom** *(Registration No: 580040)*	**2010**
CMarEng *(Chartered Marine Engineer)*	**Marine Engineering**	**The Inst. of Marine Enginering, Science and Technology (IMarEST), UK** *(Registration No: 8008776)*	**2009**
PEng *(Professional Engineer)*	**Mechanical Engineering**	**Board of Engineer, Malaysia** *(Registration No: 10000)*	**2000**
MIMarEST	**Member**	**Inst. of Marine Enginering, Science and Technology (IMarEST), UK** *(Membership No: 8008776)*	**2009**
MIEM	**Member**	**Inst. of Engineers, Malaysia** *(Membership No: M05581)*	**1999**

Employment:

Position	Employer	Period
Associate Professor	**Umm Al-Qura University**	**2014-Now**
Professor	**Universiti Malaysia Pahang (UMP): (offered)**	**2013**
Associate Professor	**Universiti Teknologi Malaysia (UTM)**	**2001-2013**
Lecturer	**Universiti Teknologi Malaysia (UTM)**	**1998-2001**
Lecturer II	**Universiti Teknologi PETRONAS (UTP)**	**1997-1998**
Lecturer	**Universiti Teknologi Malaysia (UTM)**	**1983-1997**
Structural Engineer	**McDermott International, Singapore**	**1990-1990**
Assistant Lecturer	**Universiti Teknologi Malaysia (UTM)**	**1980-1983**

Supported research and development projects related to specialization:

Date	Project title	Amount of funding

Patents and Copyright:

Title	Date

Publications (published papers and books):

15. **Iberahin Jusoh, Ateyah A. Alzahrani, "Study of the Response of Knee Joint Replacement under Daily Life Activity Loads for Healthy Weight Subjects", *Intl. Jour. of Eng Res and Mangt,* Vol. 2(12), Dec 2015.**
16. **Ateyah A. Alzahrani, Iberahin Jusoh, Suyfyan Azam, Mohd S. Alsoufi, Hamzah A. Ghulman and Talal S. Mandourah, "The Effect of Daily Life Activity Loads on Knee Joint Replacement of Overweight Subjects", *Intl. Jour. of Eng Res and Mangt,* Vol. 3(1), Jan. 2016.**

17.	**Iberahin Jusoh, Hamzah A. Ghulman, Talal S. Mandourah and Chen C. Tan, "Loading Analysis of a Typical Electricity Pylon", *Intl. Jour. of Eng Res and Mangt,* Vol. 4(10), Oct. 2017.**
18.	**Iberahin Jusoh, "Electricity Pylon with Broken Wires Condition", *Intl. Jour. of Eng Res and Tech,* Vol. 6(12), Dec 2017.**
19.	**Iberahin Jusoh, "Response of Jacket Structure to Variation in Wave Height and Water Depth", *Intl. Jour. of Eng Res and Tech,* Vol. 6(12), Dec 2017.**
20.	**Iberahin Jusoh, "Highly Stressed Elements on Electricity Pylon under Typical Loading Conditions", *Intl. Jour. of Eng Res and Tech,* Vol. 7(13), Mar 2018.**
21.	**Iberahin Jusoh, "Base Shear and Overturning Moment on Jacket Platform with Marine Growth" *Intl. Jour. of Eng Trend and Tech*, Vol 58(1), April 2018.**
22.	**Iberahin Jusoh and Hamzah A. Ghulman, "Response of Electricity Pylon to External Loading". *Intl. Jour. of Eng Res and Tech,* Vol. 7(5), May 2018**
23.	**Iberahin Jusoh and Shadi M.A. Munshi, "Effects of Current Velocity and Profile on Loading of Offshore Jacket Structure". *Intl. Jour. of Eng Trend and Tech*, Vol 59(2), May 2018**
24.	**Iberahin Jusoh, "SCF Analysis of Tubular K-Joint under Compressive and Tensile Loads". *SSRG-Intl. Journal of Mechanical Engineering*, Vol 5(10), Oct 2018**
Experience:	
25.	**University Academic Staff teaching courses in Mechanical Engineering since 1980 – Now.**
26.	**Structural Engineer, Design of Offshore Jacket Platform. 1990.**
27.	**Management Experience; as Head of Department, Deputy Dean and Director of University Centre. (2001-2009)**
28.	**Research Academic Fellowship at Osaka Pref. University, Japan. In year 1998 and in year 2000.**
29.	**Research Academic Fellowship at Cranfield University, United Kingdom. In year 2009 - 2010.**
Training Programs:	
20.	**Structures for Offshore Oil and Gas Production.**
21.	
22.	
23.	

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Talal Saleh Mandourah**	
Degree:	**PhD**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	Mechanical	The University of Dayton, USA	2004
M.Sc.	Mechanical	The University of Dayton, USA	2000
B.Sc.	Mechanical	King Abdul Aziz University	1993

Employment:

Position	Employer	Period
Assistant Professor	UQU	2004
Teaching Assistant	UQU	1996
Maintenance Supervisor	Saudi Cable Company	1993

Supported research and development projects related to specialization:

Date	Project title	Amount of funding
2017	Enhancing Properties of Kiswa Fabrics to Resist Cutting, Fire and overloads	260,000 SR
2017	Development of Internal Umra Systems	862,000 SR
2014	Development of Mina Area Air-Conditioning System	950,000 SR
2014	Development of glass fiber reinforced epoxy composites filled by rubbers extracted from tires waste	152,000 SR

Patents and Copyright:

Title	Date

Publications (published papers and books):

25. **The Effect of Daily Life Activity Loads on Knee Joint Replacement of Overweight Subjects**
26. **Bearing Strength and Failure Behavior of Bolted GLARE Joint**
27. **An integrated Approach to the Design of Cellular Manufacturing using group technology**
28. **Proposed simple electro-mechanical automotive speed control system**
29. **Loading Analysis of a Typical Electric Pylon**
30. **Design, Construction and Operation of Unmanned Ship Model for Multidisciplinary Engineering Education**

Experience:
30. **Safety and Security General Supervisor**
31. **Investment Projects General Supervisor**
32. **Assets Supervisor**
33. **Operation and Maintenance General Supervisor**
34. **General Service Supervisor**
35. **General Secretary of Higher Safety Committee**
36. **General Secretary of Higher Committee of Investment Projects**
37. **Consultant of King Abdul Aziz Campus of Kiswa Manufacturing**
38. **The President of Houses of Experts Union for Consultation Services**
39. **Chairman of Occupational and Safety Health Association**
40. **Preventive Maintenance Supervisor**
Training Programs:
24. **Occupational Safety and Health Programs Trainer**
25. **First Emergency Response and Secondary Emergency Response Trainer**
26. **MATLAB Software Trainer**
27. **Preventive Maintenance Trainer**
28. **Strategies and Planning of Maintenance**
29. **Maintenance Management By Computer (MAXIMO) Trainer**
30. **Gave Courses in all above courses**

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Dr. Eng. Kamel Mohamed Guedri**	
Degree:	**PhD.**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Energy Engineering**	**National School of Engineering of Monastir, Tunisia**	**2008**
M.Sc.	**Energy Engineering**	**National School of Engineering of Monastir, Tunisia**	**2002**
B.Sc.	**Energy Engineering**	**National School of Engineering of Monastir, Tunisia**	**2001**

Employment:

Position	Employer	Period
Associate Professor	**Umm Al-Qura University**	**2018-Present**
Assistant Professor	**Umm Al-Qura University**	**2012-2018**
Assistant Professor	**University of Gafsa, Tunisia**	**2009-2012**
Lecturer	**University of Gafsa, Tunisia**	**2005-2009**
Teaching Assistant	**University of Gafsa, Tunisia**	**2002-2005**

Supported research and development projects related to specialization:

Date	Project title	Amount of funding
2016-2017	Development of a new numerical method to study the effect of radiation in biomedical tissues	52000 SAR

Patents and Copyright:

Title	Date
Abdessattar Bouzid, **Kamel Guedri**, and Ahmed Nahhas, A photon detection apparatus and associated methodology to enable high speed operation, Patent US20160091617 A1.	**3-31-2016**

Publications (published papers and books):

31. M.A. Abbassi., M.R Safaei, R. Djebali, **Kamel Guedri**, Zeghmati B., Alrashed A.A.A.A., LBM simulation of MHD natural convection in a nanofluid filled incinerator containing a hot block, International Journal of Mechanical Sciences, 148: 393-408, **2018**.
32. **Kamel Guedri**, Abdessattar Bouzid , Abdelaziz Nasr, and Abdulmajeed S. Al-Ghamdi, Three-dimensional FTn Finite Volume Analysis of Short Pulse Laser Propagation through Biomedical Tissue Phantoms, International Journal of Applied Engineering Research, 13 (7): 4764-4775, **2018**.
33. **Kamel Guedri**, Abdessattar Bouzid , Abdelaziz Nasr, and Abdulmajeed S. Al-Ghamdi, Three-dimensional FTn finite volume solution of short-pulse laser propagation through heterogeneous medium, Thermal Science, (DOI: https://doi.org/10.2298/TSCI180302186G), accepted 5-6-**2018**.
34. **Kamel Guedri**, Abdulmajeed S. Al-Ghamdi. Improved Finite Volume Method for three-dimensional radiative heat transfer in complex enclosures containing homogenous and inhomogeneous participating media. Heat Transfer Engineering, 39 (15): 1-13, **2018**.
35. **Kamel Guedri**, Abdulmajeed S. Al-Ghamdi, and Mowffaq Oreijah. Application of high-resolution NVD differencing schemes to the FTn finite volume method for radiative heat transfer, Heat Transfer-Asian Research, 47 (2): 366-388, **2018**.
36. **Kamel Guedri**, Abdulmajeed S. Al-Ghamdi. Radiative heat transfer in complex enclosures using NVD differencing schemes of the FTn Finite Volume Method. Heat Transfer Research, 48 (15): 1379-1398, **2017**.
37. Mabrouki Jemaa, **Kamel Guedri**, Abbassi Mohamed Ammar, Jeguirim Mejdi, and Omri Ahmed. Simulation of the fast pyrolysis of Tunisian biomass feedstocks for bio-fuel production. Comptes Rendus Chimie, 19(4), Pages 466-474, **2016**.
38. **Kamel Guedri**, Al-Ghamdi Abdelmajedd, Bouzid Abdessatar, Abbassi Mohemed Ammar, Ghulman Ahmed, Evaluation of the FTn Finite Volume Method for transient radiative transfer in anisotropically scattering medium. Numerical Heat Transfer (Part A) ; Vol. 68, Issue: 10, pages 1137 – 1154, **2015**.
39. Mabrouki Jemaa, Abbassi Mohamed Ammar, **Kamel Guedri**, Jeguirim Mejdi, and Omri Ahmed. Simulation of bio-fuels production via fast pyrolysis of palm oil residues. Fuel, Vol. 159, Pages 819-827, **2015**.

40. Mliki Bouchmel, Abbassi Mohamed Ammar, **Kamel Guedri**, and Omri Ahmed, Lattice Boltzmann simulation of natural convection in an L-Shaped Enclosure in the presence of nanofluid. Engineering Science and Technology: an International Journal (Elsevier), Vol. 18, Issue 3, Pages 503-511, **2015**.

41. Afef Wannassi, Mohamed Ammar Abbassi, **Kamel Guedri**, Ahmed Omri. Parametric Studies of Wood Pyrolysis Particles. World Academy of Science, Engineering and Technology (WASET), International Journal of Chemical, Molecular, Nuclear, Materials and Metallurgical Engineering, Vol. 9, No. 10, Pages 1166-1173, **2015**.

42. Abbassi Mohamed Ammar, **Kamel Guedri**, Borjini Mohamed Naceur, Halouani Kamel, and Zeghmati Belkacem. Modeling of Radiative Heat Transfer in 2D Complex Heat Recuperator of Biomass Pyrolysis Furnace: A Study of Baffles Shadow and Soot Volume Fraction Effects. International Journal of Physical, Nuclear Science and Engineering, Vol. 8, No. 2, **2014**.

43. Mliki Bouchmel, Belgacem Nabil, Abbassi Mohamed Ammar, **Kamel Geudri**, and Omri Ahmed. Entropy Generation and Heat Transfer of Cu–Water Nanofluid Mixed Convection in a Cavity. World Academy of Science, Engineering and Technology. International Journal of Mechanical, Aerospace, Industrial, Mechatronic and Manufacturing Engineering, Vol. 8, No. 12, Pages 2122-2128, **2014**.

44. Bouzid Abdessatar, Nahhas Ahmed Mohammud, and **Kamel Guedri**. InGaAs/InP avalanche photodiode for infrared single photon detection using a time-to-voltage converter. Optics Communication, Vol. 328, Pages 37–40, **2014**.

45. Mliki Bouchmel, Abbassi Mohamed Ammar, **Kamel Guedri**, Chrigui Mouldi, and Omri Ahmed. Large Eddy Simulation of Compartment Fire with Gas Combustible. International Journal of Mechanical, Industrial Science and Engineering, Vol. 8, No . 2, **2014**.

46. **Kamel Guedri**, Borjini Mohamed Naceur, Jeguirum Mejdi, Brilhac Jean-François and Saîd Rachid. Numerical study of radiative heat transfer effects on a complex configuration of rack storage fire. Energy, Vol. 36, Issue 5, Pages 2984-2996, **2011**.

47. Méchi Rachid, Farhat Habib, **Kamel Guedri**, Halouani Kamel and SAÏD Rachid. Extension of the zonal method to inhomogeneous non-grey semi-transparent medium. Energy; 35: 1-15, **2010**.

48. Gassoumi Taoufik, **Kamel Guedri** and SAÏD Rachid. Numerical Study of the Swirl Effect on a Coaxial Jet Combustor Flame Including Radiative Heat Transfer. Numerical Heat Transfer (Part A), Vol. 56, Pages 897-913, **2009**.

49. **Kamel Guedri**, ABBASSI Mohamed Ammar, BORJINI Mohamed Naceur, HALOUANI Kamel and SAÏD Rachid. Application of the Finite Volume Method to study the effects of baffles on radiative heat transfer in complex enclosures. Numerical Heat Transfer (Part A), Vol. 55, Pages 780-806, **2009**.

50. BORJINI Mohamed Naceur, **Kamel Guedri** and SAÏD Rachid. Modeling of radiative heat transfer in 3D complex boiler with non-gray sooting media. Journal of Quantitative Spectroscopy & Radiative Transfer, Vol. 105, Pages 167-179, **2007**.

51. **Kamel Guedri**, BORJINI Mohamed Naceur, MECHI Rachid and SAID Rachid. Formulation and testing of the FTn finite volume method for radiation in 3-D complex inhomogeneous participating media, Journal of Quantitative Spectroscopy & Radiative Transfer, Vol. 98, Pages 425-445, **2006**.

52. **Kamel Guedri**, BORJINI Mohamed Naceur and FARHAT Habib. Modelization of combined radiative and conductive heat transfer in three-dimensional complex enclosures. International Journal for Numerical Methods in Heat & Fluid Flow, Vol. 15, No. 3, Pages 257-276, **2005**.

53. **Kamel Guedri**, AL-Ghamdi Abdulmajeed Saeed, and Ghulman Hamza Ahmed. Analysis of transient radiative heat transfer using high bounded schemes of the FTn Finite Volume Method. 10th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, Orlando, Florida, USA, July 14 – 16, **2014**.

54. Abbassi Mohamed Ammar, **Kamel Guedri**, Ghulman Hamza Ahmed, and AL-Ghamdi Abdulmajeed Saeed. Numeric and experimental studies of a biomass pyrolysis pilot plant with the depollution of pyrolysis products. 10th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, Orlando, Florida, USA, July 14 – 16, **2014**.

Experience:

41. **Reviewer in many international journals such as:**
    - « Energy » (Elsevier, ISSN: 0360-5442).
    - « Numerical Heat Transfer » (Taylor and Francis; ISSN: 1040-7782).
    - « Heat Transfer Engineering » (Taylor and Francis; ISSN: 0145-7632).
    - « Heat Mass Transfer » (Elsevier; ISSN: 0947-7411).
    - « Journal of the Taiwan Institute of Chemical Engineers » (Elsevier; ISSN: 1876-1070).

42. **Chairman of the Assessment Committee, Mechanical Engineering Department**

43. **Coordinator of the Seventh Standard Committee for Institutional Accreditation at Umm Al-Qura University (NCAAA)**

Training Programs:
31. **Training courses: The basics of e-learning**
32. **Training courses: e-learning environment and content construction**
33. **Training Courses: Course Management System**
34. **Training courses: Electronic testing and assessment tools**
35. **Training courses: Virtual classroom system**
36. **Training courses: How to prepare and write research proposals**

37. **Tra**

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Ahmed Fathi Mohamed Mohamed**	
Degree:	**Assistant Professor**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Production Engineering& Mechanical Design (Industrial Eng.)**	**Minia University, Egypt**	**2013**
M.Sc.	**Production Engineering& Mechanical Design**	**Minia University, Egypt**	**2008**
B.Sc.	**Production Engineering& Mechanical Design**	**Minia University, Egypt**	**2000**

Employment:

Position	Employer	Period
Assistant Professor	**Umm Al-Qura University**	**2013 till now**
Lecturer	**Umm Al-Qura University**	**2008-2013**
Demonstrator	**Minia University**	**2000-2008**

Supported research and development projects related to specialization:

Date	Project title	Amount of funding

Patents and Copyright:

Title	Date

Publications (published papers and books):

55. Ahmed F. Mohamed, Mohammed Y. Abdellah Mohamed K Hassan ''Relaxation and Compressive Characteristic in Composite Glass Fiber reinforced Pipes, International Journal of Scientific & Engineering Research 6 (9), 1823-182

56. "Fracture Properties Analysis of Notched Glass Fiber Reinforced Epoxy Laminate Using Extended Finite Element Method (XFEM)"*, submitted to journal of material structure, springer.*

57. "Static Relaxation of Glass Fiber Reinforced Pipes" has been accepted for oral presentation as well as inclusion in the conference proceedings of the ICMTM 2015: International Conference on Metallurgy Technology and Materials to be held in Berlin, Germany during May, 21-22, 2015.

58. "Synthesis and characterization of Nitrogen-doped & CaCO3-decorated reduced graphene oxide nanocomposite for electrochemical supercapacitors" Journal of Electrochimica Acta 184 (2015) 193–202, http://www.journals.elsevier.com/electrochimica-acta .

59. "Co/Cr-Decorated Carbon Nanofibers as Novel and Efficacious Electrocatalyst for Ethanol Oxidation in Alkaline Medium", : Journal of Nanoscience and anotechnology, Volume 17, Number 2, February 2017, pp. 1280-1286(7), Publisher: American Scientific Publishers, DOI: https://doi.org/10.1166/jnn.2017.12628

60. "A comparative study on Petri Nets in manufacturing applications." *Life Science Journal 2013;10(x): (ISSN: 1097-8135). http://www.lifesciencesite.com*.
61. "Finite Element Analysis for Stresses in Thin-Walled Pressurized Steel Cylinders" International Journal of Scientific & Engineering Research Volume 9, Issue 3, March-2018 201 ISSN 2229-5518.
62.
Experience:
44.
45.
46.
47.
Training Programs:
38. Practical Training course in Reverse Engineering (Hand Scan –Hand Prob. – 3D Scan)
39. Quality Control for Manufacturing Industries
40. Small Business Advisor
41.

42. **Training courses: Writing research in English using the program (End Note)**

Name:	**Abdelaziz Hassan Nasr**	
Degree:	**Ph.D.**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	Energy Engineering	National Engineering School of Monastir/University of Monastir, Tunisia	**2012**
M.Sc.	Energy Engineering	National Engineering School of Monastir/University of Monastir, Tunisia	**2006**
B.Sc.	Energy Engineering	National Engineering School of Monastir/University of Monastir, Tunisia	**2004**

Employment:

Position	Employer	Period
Teaching Assistant	Higher institute of Technology study of Zaghouan, Tunisia	2005-2006
Teaching Assistant	Higher Institute of Biotechnology of Monastir, university of Monastir, Tunisia	2006-2007
Assistant Professor	Preparatory Institute for Engineering Studies of Kairouan, Tunisia	2007-2009
Assistant Professor	Preparatory Institute for Engineering Studies of Gabes, Tunisia	2010-2012
Assistant Professor	College of Engineering and Islamic Architecture/ Umm Al-Qura University	2012-Present

Supported research and development projects related to specialization:

Date	Project title	Amount of funding

Publications (published papers and books):

63. Abdelaziz Nasr, Amin Bel Hadj Mohamed, Chokri Debissi, Jamel El Orfi, Sassi Ben Nasrallah, Evaporation of a thin binary liquid film covering one plate of a vertical channel, Revue des energies Rénouvelables 4 (11) 611-622, 2008.
64. Abdelaziz Nasr, Chokri Debissi, Jamel El Orfi, Amin Bel Hadj Mohamed, Sassi Ben Nasrallah, Evaporation of water by free convection inside two partially wetted heated vertical plates. International Journal of Heat and Technology, 1 (27), 35-42, 2009.
65. Abdelaziz Nasr, Chokri Debissi, Jamel El Orfi, Amin Bel Hadj Mohamed, Sassi Ben Nasrallah, Evaporation of water by Natural convection in partially wetted heated vertical plates: Effect of the number of the wetted zone, Journal of Engeneering and Appieled sciences, 4 (1) 51-59, 2009.
66. Abdelaziz Nasr, Chokri Debissi, Sassi Ben Nasrallah, Evaporation of a binary liquid film by free convection and inversion temperature, International Journal of Heat and Technology, 2010.
67. Abdelaziz Nasr, Chokri Debissi, Sassi Ben Nasrallah, Evaporation of a thin binary liquid film by forced convection into air and superheated steam, Journal of Thermal Science (Springer), 19 (4) 346-356 , 2010.
68. Abdelaziz Nasr, Chokri Debissi, Sassi Ben Nasrallah, Evaporation of a Binary Liquid Film by Forced Convection, Thermal Science, 2011.
69. Abdelaziz Nasr**, Chokri Debissi, Sassi Ben Nasrallah, Numerical study of evaporation by mixed convection of a binary liquid film, Energy (Elsevier), 1-12, 2011**
70. Abdelaziz Nasr**, Chokri Debissi, Jamel El Orfi, Amin Bel Hadj Mohamed, Sassi Ben Nasrallah, Numerical study of evaporation of liquid film by mixed convection in partially wetted vertical channel , Desalination and water treatment (46) 10-20, 2012.**
71. **Chokri Debissi,** Abdelaziz Nasr**, Jamel El Orfi, Amin Bel Hadj Mohamed, Sassi Ben Nasrallah, Numerical Analysis of the evaporation of water by forced convection into humid air in partially wetted vertical plates, Journal of Engeneering and Appieled sciences, 3 (11) 811-821, 2008.**
72. **Foued Msali,** Abdelaziz Nasr**, Sassi Ben Nasrallah, Identification of thermo-physical properties of solids using power measurements, (29) 65-70, 2011.**

73. **Chokri Debissi,** Abdelaziz Nasr**, Sassi Ben Nasrallah, evaporation of a binary liquid film flowing down the wall of two vertical plates, International Journal of Thermal science, Sciences 72 (2013), 34-46.**

74. Abdelaziz Nasr**, Abdulmajeed S.Al Ghamdi, evaporation and condensation of binary liquid film, THERMAL SCIENCE, 2015.**

75. Chokri Debbissi Hfaiedh, **Abdelaziz Nasr*,** Sassi Ben Nasrallah, Evaporation of a binary liquid film flowing down the wall of two vertical plates, International Journal of Thermal Sciences, 72 (2013) 34-46.

76. Jbara Abdesslem,*, Slimi Khalifa, **Nasr Abdelaziz** , Mhimid Abdallah , Radiative properties effects on unsteady natural convection inside a saturated porous medium. Application for porous heat exchangers, Energy 61 (2013) 224-233.

77. Kamel Guedri, Abdessattar Bouzid , **Abdelaziz Nasr**, and Abdulmajeed S. Al-Ghamdi, Three-dimensional FTn Finite Volume Analysis of Short Pulse Laser Propagation through Biomedical Tissue Phantoms, *1,2, international Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 7 (2018) pp. 4764-4775

16. Kamel Guedri, Abdessattar Bouzid , **Abdelaziz Nasr**, and Abdulmajeed S. Al-Ghamdi, Three-dimensional FTn finite volume solution of short-pulse laser propagation through heterogeneous medium

17. Abdelaziz Nasr, Abdulmajeed S. Al-Ghamdi, Numerical study of evaporation of falling liquid film on one of two vertical plates covered with a thin porous layer by free convection, International Journal of Thermal Sciences 112 (2017) 335-344.

18. Abdelaziz Nasr, Heat and mass transfer for liquid film condensation along a vertical channel covered with a thin porous layer, International Journal of Thermal Sciences 124 (2018) 288–299.

19. Abdelaziz Nasr, Abdulmajeed S. Al-Ghamdib, M'barek Feddaouic, Mohammad S. Alsoufib, Sassi Ben Nasrallaha, Numerical study of falling binary liquid film evaporation: liquid film thickness, ***Desalination and Water Treatment,*** 74 (2017) 35–43.

20. Abdelaziz Nasr& Abdulmajeed S. Al-Ghamdi, EVAPORATION OF FALLING LIQUID FILM ON A VERTICAL CHANNEL COVERED WITH A THIN POROUS LAYER, *Journal of Porous Media*, 19 (12): 1045–1060 (2016).

21. Abdelaziz NASR and Abdulmajeed S. Al-GHAMD, EVAPORATION AND CONDENSATION OF FALLING BINARY LIQUID FILM, THERMAL SCIENCE: Year 2017, Vol. 21, No. 1A, pp. 1-12

22. Abdelaziz NASR and Abdulmajeed S. Al-GHAMD, SIMULTANEOUS HEAT AND MASS TRANSFER DURING EVAPORATION AND CONDENSATION OF A BINARY LIQUID FILM, 17 April 2017

23. Abdelaziz Nasr & Abdulmajeed S. Al-Ghamdi, Evaporation of water/ammonia binary liquid film falling down on one plate of a vertical channel, ***Desalination and Water Treatment,*** (2015) 1–12.

24. Abdelaziz Nasr, Abdulmajeed S. Al-Ghamdi , Heat and mass transfer in binary film evaporation and condensation in vertical channel, International Journal of Engineering & Technology, 4 (1) (2015) 214-226

Conferences
43. Abdelaziz Nasr**, Chokri Debissi, Jamel El Orfi, Sassi Ben Nasrallah, Etude de l'évaporation d'un mélange binaire en convection forcée dans l'air humide et dans la vapeur surchauffée. 1ème Conférence international sur la conversion et la maîtrise de l'énergie, 11-13 Avril 2008, Sousse-Tunisie.**
44. Abdelaziz Nasr, **Chokri Debissi, Jamel El Orfi, Amin Bel Hadj Mohamed, Sassi Ben Nasrallah, Etude numérique de l'évaporation en convection naturelle dans un canal vertical dont l'une de ses plaques est partiellement humide. 9ème Colloque National de Recherche en Physique, Mars 2008, Hammamet-Tunisie.**
45. Abdelaziz Nasr**, Chokri Debissi, Jamel El Orfi, Sassi Ben Nasrallah, Evaporation of binary liquid mixture by forced convection. 4th International Conference on advances in Mechanical Engineering and Mechanics, 16-18 December 2008, Sousse-Tunisia.**
46. Abdelaziz Nasr, **Chokri Debissi, Jamel El Orfi, Amin Bel Hadj Mohamed, Sassi Ben Nasrallah, Evaporation of binary liquid mixture by free convection. 14ème Journée Internationales de Thermique, 27-29 Mars 2009, Djerba-Tunisie.**
47. Abdelaziz Nasr, **Chokri Debissi, Sassi Ben Nasrallah, Numerical Analysis of the evaporation of water by natural convection inside two heated vertical plates where one is partially wetted. 1st International Workshop on systems Engineering Design & Applications (SENDA'08), 16-18 Mars 2008, Monastir-Tunisia.**
48. Abdelaziz Nasr, **Chokri Debissi, Sassi Ben Nasrallah, Etude de l'évaporation d'un mélange liquide binaire en convection mixte dans l'air humide et dans la vapeur surchauffée. 1st International Workshop on systems Engineering Design & Applications (SENDA'08), 16-18 Mars 2008, Monastir-Tunisia.**
49. Abdelaziz Nasr, **Chokri Debissi, Jamel El Orfi, Amin Bel Hadj Mohamed, Sassi Ben Nasrallah, Etude numérique de l'évaporation en convection forcée dans un canal vertical chauffée dont l'une est partiellement humide. 8th Sysmposium Tunisia-Japan on society, science & technology, 29-31 October 2007, Sousse-Tunisia.**
50. Abdelaziz Nasr, **Chokri Debissi, Jamel El Orfi, Amin Bel Hadj Mohamed, Sassi Ben Nasrallah, Etude numérique de l'évaporation en convection forcée dans un canal vertical chauffée dont l'une est partiellement humide. 8th Sysmposium Tunisia-Japan on society, science & technology, 29-31 October 2007, Sousse-Tunisia.**
51. Abdelaziz Nasr**, Chokri Debissi, Jamel El Orfi, Amin Bel Hadj Mohamed, Sassi Ben Nasrallah, Evaporation and condensation of a thin binary liquid film by forced convection. 9ème Tunisia-Japan Symposium on Sience, Society and Technology Kantaoui forum, November 9th-11th, 2008, Sousse-Tunisie.**
52. Abdelaziz Nasr**, Chokri Debissi, Sassi Ben Nasrallah, Evaporation par convection mixte d'un film de liquide binaire ruisselant sur l'une des plaques d'un canal vertical ,2ème Colloque International sur l'Energie CIE2012, 26-28 2012, Tozeur, Tunisie.**
53. Abdelaziz Nasr**, Chokri Debissi, Sassi Ben Nasrallah, Numerical study of evaporation by mixed convection of a binary liquid film flowing down the wall of two vertical plates, International Symposium on Multiphase flow and Transport Phenomena April 22-25, 2012, Agadir, Morocco.**
54. Abdelaziz Nasr**, Abdesslem Jbara, Chokri Debbissi Hfaiedh, Sassi Ben Nasrallah, Numerical study of evaporation by mixed convection of a binary liquid film flowing down the wall of two vertical plates, The Fourth International Renewable Energy Congress (IREC 2012), December 20-22, Sousse, Tunisia.**
55. Abdelaziz Nasr**, Chokri Debbissi Hfaiedh, Sassi Ben Nasrallah, Evaporation by mixed convection of a binary liquid film, The Fourth International Renewable Energy Congress (IREC 2012), December 20-22, Sousse, Tunisia.**
56. Abdelaziz Nasr**, Chokri Debissi, Sassi Ben Nasrallah, Condensation par convection mixte en film de liquide binaire ruisselant sur l'une des plaques d'un canal vertical Journée des jeunes chercheurs 23-25,Octobre 2012.**
57. Abdelaziz Nasr**, Chokri Debissi, Sassi Ben Nasrallah, Evaporation par convection mixte en film de liquide binaire ruisselant sur l'une des plaques d'un canal vertical, Journée des jeunes chercheurs 23-25,Octobre 2012.**
58. **Abdesslem Jbara,** Abdelaziz Nasr**, Khalifa Sellimi, Abdallah Mhumid, Numerical study of evaporation by mixed convection of a binary liquid film flowing down the wall of two vertical plates, The Fourth International Renewable Energy Congress (IREC 2012), December 20-22, Sousse, Tunisia.**
59. **Abdesslem Jbara,** Abdelaziz Nasr**, Khalifa Sellimi, Abdallah Mhumid, Numerical study of evaporation by mixed convection of a binary liquid film flowing down the wall of two vertical plates, Journée des jeunes chercheurs 23-25,Octobre 2012.**
18. Abdelaziz Nasr & Abdulmajeed S. Al-Ghamdi, 9ème Congrès Francophone de Génie des Procédés CFGP, 2014, Agadir, Morocco.

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Talaat Ahmed Mohamed Elbenawy**	
Degree:	**Assistant professor**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	Production	Ain shams University	1995
M.Sc.	Production	Ain shams University	1988
B.Sc.	Design&Producion	Ain shams University	1981

Employment:

Position	Employer	Period
Demonstrator	Ain shams University, Egypt	1981-1988
Assistant Lecture	Ain shams University, Egypt	1988-1995
Assistant Professor	Ain shams University, Egypt	1995-now
Assistant Researcher	KTH, Stockholm, Sweden (Temporary)	1996-1998
Assistant Professor	UQU, Makkah, Saudi Arabia (Temporary)	2002-now

Supported research and development projects related to specialization:

Date	Project title	Amount of funding
1981-1984	Solar Energy	Was not known
1984-1988	Workability of materials	Was not known
1990-1995	Rapid Solidification	Was not known
1996-1998	Effect of lattice defects on materials thermodynamics	Was not known
1013-2015	Hot Deformation Characterization of AISI316 and AISI304 Stainless Steels	2000000 SAR
2016-2018	Cutting force –machine tools vibration	250000 SAR

Patents and Copyright:

Title	Date
None	

Publications (published papers and books):

1. STRUCTURE, PROPERTIES AND WORKABILITY OF CAST AL-CU ALLOYS, ***Talaat El-Benawy,*** (M. Sc. thesis, in Mechanical Engineering, Ain Shams University, Faculty of Engineering, Dept. of Design and Production engineering, Cairo-Egypt, 1988)
2. WORKABILITY OF AL-CU ALLOYS:, M. Taha, N. El-Mahallawy and ***Talaat El-Benawy,*** Proc. of 2nd International Conference on Design and Production Eng., Cairo Univ. (1988)
3. WORKABILITY OF UNIDIRECTIONALLY SOLIDIFIED AL-8 wt % CU ALLOY: *Part I. Cold Workability*, M. Taha, N. El-Mahallawy and ***Talaat El-Benawy,*** (Journal of Materials processing Technology, 35 (1992), P. 61-70
4. WORKABILITY OF UNIDIRECTIONALLY SOLIDIFIED AL-8 wt % CU ALLOY: *Part Ii. Hot Workability*, M. Taha, N. El-Mahallawy and ***Talaat El-Benawy,*** (Journal of Materials processing Technology, 35 (1992), P. 71-81)
5. STUDY OF SOLIDIFICATION MECHANISM IN CASTING BY RAPID SOLIDIFICATION PROCESS, ***Talaat El-Benawy,*** (Ph. D. thesis, in Mechanical Production Engineering, Ain Shams University, Faculty of Engineering, Dept. of Design and Production Engineering, Cairo-Egypt, in cooperating with Royal Institute of Technology, Stockholm, Sweden, **1995** 1995)
6. ON COOLING BEHAVIOUR AND MICROSTRUCTURE OF RAPIDLY SOLIDIFIED AG-CU ALLOYS, ***Talaat El-Benawy***, N. El-Mahallawy, M. Taha and H. Fredriksson, (Materials Science and Technology, 14 (1998), P. 721-725.)
7. ON THE MODIFICATION OF Al-SI ALLOYS BY USING STRONTIUM, ***Talaat El-Benawy*** and Hasse Fredriksson, (5th International Conference on Production Engineering and Design for Development, April 28-30, 1998, Cairo, P. 319-328.)

8. ON THE SOLIDIFICATION OF AL-SI EUTECTIC ALLOYS UNMODIFIED AND MODIFIED, ***Talaat El-Benawy*** and H. Fredriksson, (Proceedings from Materials Solutions Conference 98 on aluminium Casting Technology, 12-15 October 1998, Rosemont, Illinois, P243)
9. SOLIDIFICATION PROCESSING OF SI: AN EXPERIMENTAL STUDY OF THE VARIATION OF LATENT HEAT AND LATTICE DEFECTS WITH THE COOLING RATE, Lena Magnusson, ***Talaat El-Benawy***, Hasse Fredriksson, internal report , Royal Institute of technology, Materials processing Dept, Stockholm, Sweden, 1998
10. AN EXPERIMENTAL REPORT ON THE RELATIONSHIP BETWEEN THE COOLING RATE OF A HYPO-EUTECTIC IRON AND ITS STRUCTURE AND PROPERTIES, H. Hadel, ***Talaat El-Benawy***, N. El-Mahallawy and N. Taha, (International Journal of Cast Metals Research, Vol. 12, No. 1., 2000)
11. EXPERIMENTAL INVESTIGATION AND THERMODYNAMIC ASSESSMENT OF THE Al-RICH SIDE OF THE Al-B SYSTEM, Jonas Fjellstedt, Anders E. W. Jarfors and ***Talaat El-Benawy***, (Materials and Design, Vol. 22, P. 443-449, 2001)
12. SOLIDIFICATION MECHANISM OF UNMODIFIED AND STRONTIUM MODIFIED AL-SI ALLOYS, ***Talaat El-Benawy*** and Hasse Fredriksson, (Materials Transactions, JIM, Vol. 41, No. 4 (2000) pp. 507 to 515)
13. APPLICATION OF FREQUENCY DOMAIN PROCESSING TO X-RAY RADIOGRAPHIC IMAGES OF WELDING DEFECTS, Maher I. Rajab, ***Talaat A. El-Benawy***, Mohammed W. Al-Hazmi, (Journal of X-Ray Science and Technology Vol. 15, No. 3, 2007, P. 147 – 156)
14. PREDICTION OF HYPOEUTECTIC GRAY IRON MICROSTRUCTURE DURING SOLIDIFICATION AND SOLID TRANSFORMATION USING SIMPLE FOURIER MODE, Mohamed A. Taha1, Nahed A. El-Mahallawy, Ahmed. M. El-Sabbagh, ***Talaat El-Benawy*** and Hasan F. Hadla, Key Engineering Materials Vol. 457 (2011) pp 293-298.
15. OPTIMAL HOT DEFORMATION CHARACTERIZATION OF AA5083 ALUMINIUM ALLOY, A.H. Backar, D.K. Suker, ***T.A. Elbenawy***, H.A. Ghulman, M.W. Al-Hazmi, International Journal of Mechanical & Mechatronics Engineering IJMME-IJENS Vol:16 (2016), No:03.
16. HOT DEFORMATION CHARACTERIZATION OF AISI316 AND AISI304 STAINLESS STEELS. D.K. Suker, ***T.A. Elbenawy***, A.H. Backar, H.A. Ghulman, M.W. Al-Hazmi, International Journal of Mechanical and Mechatronics Engineering, 17 (2), 2017, pp. 1-14.

Experience:

Laboratories:

Materials Engineering, Mechanical Testing, Casting of Metals, Welding of metals, Metallurgy, Materials Forming, Metal Forming Machines, Machining.

Tutorials:

Materials Engineering, Mechanical Testing, Manfactring Technolog processes, Casting, Welding, Metallurgy, Theory of Metal Cutting, Tool Design, Theory of Metal Forming, Die Design.

Lectures:

For B. Sc. Students:

1. Engineering Materials
2. Production Engineering (machining, casting, welding and metal forming)
3. Design of Metal forming Machines (Press Design, rolling Mills Design)
4. Foundry technology

For Diploma Students:

1. Casing of metals
2. Engineering Metallurgy

For M. Sc. Students:

1. Solidification, 10 hours course
2. Advanced Metallurgy, 10 hours course
3. Theory of metal forming

For Ph. D. Students:

1. Advanced Metallurgy, selected topics

Training Programs:

1. **Academic Teaching methods course, in Egypt**
2. **MiniTab Software, in Egypt**
3. **Scanning Microscope, in Sweden**
4. **How to make Exams, in Sweden**
5. **Ansys Program, in Saudi Arabia**
6. **abaqus software, in Saudi Arabia**

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Ahmed Hassan Backar**	
Degree:	**Assistant Professor**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Production Engineering**	**Alexandria University - Egypt**	**2003**
M.Sc.	**Production Engineering**	**Alexandria University - Egypt**	**1999**
B.Sc.	**Production Engineering**	**Alexandria University - Egypt**	**1993**

Employment:

Position	Employer	Period
Assistant Professor	**Umm Al-Qura University**	**2007 - now**
Assistant Professor	**Alexandria University**	**2003 - 2007**
Lecturer	**Alexandria University**	**1999 - 2003**
Teaching Assistant	**Alexandria University**	**1993 - 1999**

Supported research and development projects related to specialization:

Date	Project title	Amount of funding
2013	**Designer Materials: Achieving the Materials Properties via Controlling the Deformation Conditions**	**SR 2000,000**

Patents and Copyright:

Title	Date

Publications (published papers and books):

78. **Optimal Hot Deformation Characterization of AA5083 Aluminum Alloy, International Journal of Mechanical & Mechatronics Engineering IJMME, 2017**
79. **Hot Deformation Characterization of AISI316 and AISI304 Stainless Steels International Journal of Mechanical & Mechatronics Engineering IJMME, 2016**
80. **Fatigue of Austempered Ductile Iron, LAMBERT Academic Publishing, 2016, ISBN 978-3-659-89327-8**
81. **Finite Elements Analysis of the Airplane C-Duct Acoustic Skin Cracking", 10th International Congress of Fluid Dynamics (ICFD10), Egypt, 2010.**

Experience:

48.

Training Programs:

60.

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Mohammed Y. Abdellah**	
Degree:	**Assistant Professor**	

Academic Career:

Degree	Specialization	Institution	Year
Ph.D.	**Production engineering and design (Fracture mechanics)**	**Minina Univesity, Egypt**	**2013**
M.Sc.	**Production engineering and design**	**Minina Univesity, Egypt**	**2009**
B.Sc.	**Production engineering and design**	**Minina Univesity, Egypt**	**2005**

Employment:

Position	Employer	Period
Assistant professor	**Umm-Al Qura university, KSA**	**2015-til now**
Assistant professor	**South Valley University, Egypt**	**2013-till now**
Assistant lectuerer	**South Valley University, Egypt**	**2005-2013**

Supported research and development projects related to specialization:

Date	Project title	Amount of funding
2005	**Strengthen aluminum alloy 6061**	
2014	**Size effect of composite laminates**	
2018	**Enhancement Kaaba clothing**	**500 SRAl**

Patents and Copyright:

Title	Date

Publications (published papers and books):

[1] **Mohammed Y. Abdellah,** H. I. Fathi, A. M. M. Abdelhaleem, and M. Dewidar, "Mechanical Properties and Wear Behavior of a Novel Composite of Acrylonitrile–Butadiene–Styrene Strengthened by Short Basalt Fiber," J. Compos. Sci., vol. 2, 2018.

[2] Amr A. Ali, **Mohammed. Y. Abdella**h, M. K. Hassan, and S. T. Mohamed, "Optimization of tensile strength of Reinforced Rubber Using Taguchi Method," International Journal of Scientific & Engineering Research, vol. 9, 2018.

[3] M. K. Hassan**, M. Y. Abdellah,** A. F. Mohamed, T. S. ElAbiadi, S. Azam, and W. Marzouk, "Fracture Toughness of Copper/Glass-Reinforced Epoxy Laminate Composites," American Journal of Materials Engineering and Technology, vol. 6, pp. 1-7, 2018.

[4] **M. Y. Abdellah**, "Comparative Study on Prediction of Fracture Toughness of CFRP Laminates from Size Effect Law of Open Hole Specimen Using Cohesive Zone Model," *Engineering Fracture Mechanics,* vol. 187, 2018.

[5] M. Q. K. **Mohammed Y. Abdellah**, Mohammad S. Alsoufi, Nouby M. Ghazaly, G. T. Abdel-Jaber, "Mechanical Properties of Lab Joint Composite Structure of Glass Fiber Reinforced Polymers," *Materials Sciences and Applications,* vol. 8, pp. 553-565, 2017.

[6] H. S. F. **Mohammed Y. Abdellah,** G. T. Abdel-Jaber, A. M. Hashem, "Characteristic Properties of Glass Fiber Reinforced Sugarcane Bagasse Medium Density Fiber Board," *Ciência & Tecnologia dos Materiais,* vol. 29, 2017.

[7] A. F. G. **Mohammed Y. Abdellah**, Ahmed F. Mohamed, Ahmed Bakr Khoshaim, "Protection of limestone Coated with Different Polymeric Materials," *American Journal of Mechanical Engineering,* vol. 5, 2017.

[8] **M. Y. Abdellah,** Mohamed K. Hassan, Tareq S. ElAbiadi, Ahmed F. Mohamed, S. Azam and W. W. Marzouk, "Essential Work of Fracture and Size Effect in Copper/Glass-Reinforced Epoxy Laminate Composites Used as MEMS Devices," *American Journal of Mechanical Engineering,* vol. 5, pp. 234-238, 2017.

[9] M. K. Hassan, A. El Ameen, A. F. Mohamed, and **M. Y. Abdellah,** "Fabrication of CdTe0. 65P0. 35/Si Solar Cell with High Efficiency Using Double Layer Antireflection," *American Journal of Nanomaterials,* vol. 5, pp. 7-10, 2017.

[10] M. K. Hassan, A. El Ameen, A. F. Mohamed, and **M. Y. Abdellah**, "Effect of Adding Nanostructured LaGdSmO2-Based Electrolyte on The Electric Performance of Solid Oxide Fuel Cell," 2017.

[11] **M. Y. Abdellah**, "Delamination Modeling of Double Cantilever Beam of Unidirectional Composite Laminates," *Failure analysis and prevention,* 2017.

[12] **M. Y. Abdellah**, "Essential Work of Fracture Assessment for Thin Aluminium Strips Using Finite Element Analysis," *Engineering Fracture Mechanics,* 2017.

[13] N. E. Bondok, **Mohammed Y. Abdellah,** Hamza A. Ghulman, "Numerical Analysis of Compressive Flow and Fracture Toughness of Aluminum Powder Compacts," *American Journal of Materials Engineering and Technology,* vol. 4, pp. 16-21, 2016.

[14] **M. Y. Abdellah,** Ayman M. M. Abdelhaleem, Hesham I. Fathi, Montasser Dewidar, "Mechanical Properties of ABS Embedded with Basalt Fiber Fillers," *Journal for Manufacturing Science and Production,* 2016.

[15] **M. Y. Abdellah,** M. K. Hassan, T. Mandourah, and A. F. Mohamed, "Bearing Strength and Failure Behavior of Bolted GLARE Joints,", *International Journal of Mechanical & Mechatronics Engineering IJMME-IJENS, vol. 16,* 2016.

[16] **M. Y. Abdellah**, M. K. Hassan, and M. S. Alsoufi, "Fracture and Mechanical Characteristics Degradation of Glass Fiber Reinforced Petroleum epoxy Pipes," *Journal for Manufacturing Science and Production,* vol. 16, pp. 33-40, 2016.

[17] N. G. Naguib, M. K. Hassan, **Y. A. Mohammed** , W. W. Marzouk, and M. A. Abdel-Rahman, "Evaluation of Fracture Toughness of Epoxy/Glass Fiber and its Nano Composites via the Essential Work of Fracture (EWF) Method'','' *MJET,* vol. 2, 2015.

[18] N. G. Naguib, M. K. Hassan, **M. Y. Abdellah**, W. W. Marzouk, and M. A. Abdel-Rahman, "''Effect of Adding Nano-Fillers on the Mechanical Properties of Glass Fiber Reinforced Polymer'','' *MJET,* vol. 2, 2015.

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[26] A .M. M. A., Hesham I. Fathy , **Mohammed Y. Abdellah**, Montasser Dewidar, Mohamed A. Khalil, "Tensile Behavior of Acrylonitrile-Butadiene-Styrene (ABS) Reinforced with Basalt Fiber (BF)," in *The third international conference on energy engineering (ICEE)*, 2015.

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[29] F. M. Ahmed ,**Y. A. Mohammed**, and K. H. Mohammed, "Relaxation and Compressive Characteristic in Composite Glass Fiber reinforced Pipes," 2015.

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1.

Experience:

3/1/6 Curriculum Vitae of Faculty Members over the Past Five Years.

Name:	**Mohammed Yunus**	
Position:	**Assistant Professor**	

Academic Career:			
Degree	**Specialization**	**Institution**	**Year**
Ph.D.	**Thermal and manufacturing**	**Anna University, India**	**2012**
Master of Technology	**Machine Design**	**Visvesvaraiah Technological University (VTU), India.**	**2000**
B.E.	**Mechanical Engineering**	**Gulbarga University, India**	**1997**

Employment:		
Position	**Employer**	**Period**
Assistant Professor	**Umm AlQura University**	**2014 till now**
Professor	**HKBK College of Engineering, Bangalore affliated to VTU University, India.**	**2012- 2014**
Assistant Professor	**HKBK College of Engineering, Bangalore affliated to VTU University, India.**	**2010-2012**
Lecturer	**Higher Institute of Hoon, Libya.**	**2008-2010**
Assistant Professor	**KNS Institute of Technology, Bangalore affliated to VTU University, India.**	**2007-2008**
Assistant professor	**HKBK College of Engineering, Bangalore affliated to VTU University, India.**	**2006-2007**
Lecturer	**HKBK College of Engineering, Bangalore affliated to VTU University, India.**	**1999-2006**
Lecturer	**KBN College of Engineering, Gulbarga, India.**	**1997-1998**

Supported research and development projects related to specialization:		
Date	**Project title**	**Amount of funding**

Patents and Copyright:	
Title	**Date**

Publications (published papers and books):

1. Mohammed Yunus, Hamza A. Ghulman, Shadi M.Munshi, J. Fazlur Rahman, Sufyan Azam, Md. Asadullah and Mohammed Irfan, Optimization and Analysis (Failure Mode Effect and Finite Element) of a Common DTH Dish Antenna Bracket Assembly, International Journal of Mechanical Engineering & Technology , 5(9), 2014.

2. Mohammed Yunus and Mohammad S. Alsoufi, Effect Of Heat Treatment On Stress Corrosion Cracking Resistance Of Al-Zn-Mg-Cu Alloy Used In Aerospace Engineering Applications, BEST: International Journal of Management, Information Technology and Engineering. 3(8), 2015, Pp. 19-34.

3. Mohammed Yunus, Mohammad S. Alsoufi and Iftekar Hussain H., Study and Analysis of Performance Characteristics of Biodiesel Formed by Different Blends of Honge and Mustard Oil using 4 Stroke C.I. Engine, International Journal of Emerging Research in Management &Technology, 4(7) , Pp.220-229.

4. Mohammed Yunus, Mohammad S. Alsoufi and Iftekar Hussain H., Sound Source Localization and Mapping Using Acoustic Intensity Method for Noise Control in Automobiles and Machines, International Journal of Innovative Research in Science, Engineering and Technology, 4(7), 2015, Pp. 6173-6185.

5. Mohammed Yunus, Mohammad S. Alsoufi and Mohammed Salman Mustafa, Application of Taguchi Design Approach in the Optimization of Die Design Parameters of a Two Cavity Injection Molding Tool for a Fan Blade Back Cover, International Journal in IT and Engineering, 3(7), 2015, Pp. 11-20.
6. Mohammed Yunus and Mohammad S. Alsoufi, A Statistical Analysis of Joint Strength of Dissimilar Aluminium Alloys Formed by Friction Stir Welding using Taguchi Design Approach, ANOVA for Optimization of Process Parameters, IMPACT: International Journal of Research in Engineering & Technology, 3(7), 2015, Pp. 63-70.
7. Mohammed Yunus, Mohammad S. Alsoufi and Mohammed Salman Mustafa, Optimizing the Die Design Parameters of a Two Cavity Injection Molding Tool for a Fan Blade Back Cover using Mold Flow Analysis, International Journal in IT and Engineering, 3(6), 2015, Pp. 92-103.
8. Mohammed Yunus, Shadi M. Munshi, Sneha R. and Iftekar Hussain H., Design and Fabrication of Cost Effective Potato Planting Machine to Increase Quality of Potato, International Journal in IT and Engineering, 3(10), 2015, Pp.36-47.
9. Mohammed Yunus, Mohammad S. Alsoufi and Mohammed Asadullah, Economical and Technical Way of Ladle Pre-heating by the Use of Flameless Oxyfuel (HSD/LPG) Gas in the Steel Industry, Elixir International Journal, Elixir Mech. Engg. 95 (2016) 40776-40781.
10. Mohammed Yunus, Mohammad S. Alsoufi and Mahaboob Tabriz Basha, Functional Design for the Manufacture of Quality and Cost Effective Assembly Components of an Automobile Car using FEA, Elixir International Journal, Elixir Mech. Engg.,93 (2016) 39506-39510.
11. Mohammed Yunus and Mohammad S. Alsoufi, Multi-Objective Optimization of Joint Strength of Dissimilar Aluminum Alloys Formed by Friction Stir Welding Using Taguchi-Grey Relation Analysis, International Journal of Engineering & Technology, 16(4), 2016, Pp. 10-17.
12. Mohammed Yunus and Mohammad S. Alsoufi, Multi-output optimization of Tribological characteristics control factors of thermally sprayed industrial ceramic coatings using hybrid Taguchi-grey relation analysis, Friction by Springer, September 2016, 4(3), pp 208–216.
13. Mohammed Yunus, Mohammad S. Alsoufi and Shadi M. Munshi, Taguchi-Grey Relation Analysis for Assessing the Optimal Set of Control Factors of Thermal Barrier Coatings for High-Temperature Applications, Mechanics of Advanced Materials and Modern Processes- Springer Open, Springer Intl. Publishing AG. 2(4), 2016, Pp. 1-8,. DOI:10.1186/s40759-016-0011-z.
14. Mohammed Yunus, Mohammad S. Alsoufi and Anil Kumar Rathod, Design, manufacture and measurements of beta-type Sterling engine with rhombic drive mechanism, J. Modern Mechanical Engineering, 6, 2016 PP. 113-128. DOI:10.4236/mme.2016.64012.
15. Mohammed Yunus, Mohammad S. Alsoufi and Mohammed Irfan, Application of QC tools for continuous improvement in an expensive seat Hardfacing process Using TIG welding, International Journal for Quality Research, 10(3), 2016, Pp.143–154.
16. Ataulla, Mohammed Yunus and Mohammad S. Alsoufi, Wavelets in the Analysis of Autoregressive Conditional Heteroskedasticity (ARCH) Models using Neural Network, American Journal of Applied Mathematics, 4 (2), 2016, Pp. 92-98. doi:10.11648/j.ajam.20160402.1
17. Mohammed Yunus and Mohammad S. Alsoufi, Experimental investigations on Precision Machining of Thermal barrier coatings and Application of the Grey Relational Approach to Determine Optimum Process Parameters, J. High Temperature Material Processes, 20(, No.4, Pp:333-354
18. Mohammed Yunus and Mohammad S. Alsoufi, Prediction of Mechanical Properties of Plasma Sprayed Thermal Barrier Coatings (TBCs) with Genetic Programming (GP), International J. of Engineering Trends and Technology, Vol. 47, No. 3, 139-145. DOI: 10.14445/22315381/IJETT-V47P223.
19. L. H. Manjunatha, Mohammed Yunus, Mohammad S Alsoufi and P Dinesh, Development and Comparative Studies of Aluminum-Based Carbon Nano Tube Metal Matrix Composites using Powder Metallurgy and Stir Casting Technology, International Journal of Scientific and Engineering Research, Vol.8, No. 2, Pp:521-526.
20. Mohammed Yunus, Mohammad S. Alsoufi, Post-Processing of Ceramic Oxide Coated Surfaces using Microwave Glazing, J. High Temperature Material Processes, Vol. 21, No.1, Pp:37-52. DOI:10.1615/HighTempMatProc.2017020399.
21. Mohammed Yunus, Mohammad S. Alsoufi, J. Mathematical Modelling of a Friction Stir Welding Process to Predict the Joint Strength of Two Dissimilar Aluminium Alloys using Experimental Data and Genetic Programming, Modelling and Simulation in Engineering, Hindawi Group. Volume 2018, Article ID 4183816, 18 pages. DOI: 10.1155/2018/4183816
22. Mohammed Yunus, Mohammad S. Alsoufi, Experimental Investigations into the Mechanical, Tribological and Corrosion Properties of Hybrid Polymer Matrix Composites Comprising Ceramic Reinforcement for Biomedical Applications, International Journal of Biomaterials, Hindawi Group, August 2018, Pp.1-8. DOI: 10.1155/2018/9283291

Experience:
49. **Ph.D. Thesis Evaluation**
50. **Deputy Superintendent of examiner for conducting final exams**
51. **Finite Element Analysis trainer**
52.
Training Programs:
61.
62.
63.
64.

COURSE SPECIFICATIONS

Form

Course Title: Thermal Analysis of Materials

Course Code: 804605–3

Date:31–10–2018	**Institution**: Umm Alqura University
College: Engineering and Islamic Architecture **Department**: Mechanical Engineering	

A. Course Identification and General Information

1. Course title and code: **Thermal Analysis of Materials, 804605-3**		
2. Credit hours: **Three Credit hours**		
3. Program(s) in which the course is offered: (If general elective available in many programs indicate this rather than list programs) **Elective Course (Manufacturing & Materials Engineering Track) in Mechanical Engineering Master of Science Program.**		
4. Name of faculty member responsible for the course: **Dr. Talaat Ahmed Elbenawy**		
5. Level/year at which this course is offered: **Either level 3 or level 4**		
6. Pre-requisites for this course (if any): **Supervisor approved + Department**		
7. Co-requisites for this course (if any):		
8. Location if not on main campus:		
9. Mode of Instruction (mark all that apply):		
a. Traditional classroom	☒ percentage?	**80%**
b. Blended (traditional and online)	☐ percentage?	
c. E-learning	☐ percentage?	
d. Correspondence	☐ percentage?	
f. Other	☒ percentage?	**20%**
Comments:		

B Objectives

1. The main objective of this course:

The main objective of the course is to provide students with the foundations and necessary for understanding the principles of thermal analysis of materials. Students will acquire knowledge necessary for measurement of the material physical properties as a function of temperature.

.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

Researches reports from both Internet and library will be frequently required from students

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Thermal Analysis of materials describes, in depth, a set of techniques which are widely used in both academic research and industry. These techniques are able to characterize the wide range of materials physical and thermodynamic properties.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to thermal analysis instruments and techniques	**2**	**4**
Furnaces and measurements methods	**1**	**2**
Differential thermal analysis (DTA, DSC and their applications)	**1**	**2**
Dilatometry and interferometry	**2**	**4**
Advanced Applications of DTA and TG	**2**	**4**
Thermogravimetric analysis	**2**	**4**
Manipulation of data	**2**	**4**

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	**24**	----------	----------	----------	----------	**24**
	Actual	**24**	----------	----------	----------	----------	**24**
Credit	Planned	**3**	----------	----------	----------	----------	**3**
	Actual	**3**	----------	----------	----------	----------	**3**

3. Individual study/learning hours expected for students per week. **3-5 hrs**

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Acquaintance about thermal analysis of materials through understanding different techniques of thermal analysis and advanced applications**	**Lectures: given on topics as class progress**	- **Regular Exams** - **Final exams.**
1.2	**Acquaintance about data manipulation**		
2.0	**Cognitive Skills**		
2.1	**Able to use knowledge of materials properties in order to improve materials design**	**Extensive engineering application examples given in lectures**	**Analysis report for specific application will be required**
2.2	----------	----------	----------
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Able to Solve problems and issues in some applications**	**Giving Examples in Lectures**	**Analysis report for specific application will be required**
3.2	----------	----------	----------
4.0	**Communication, Information Technology, Numerical**		
4.1	**Able to make some scientific report work and Communicates effectively with academic recipients**	**Giving Examples in Lectures**	**Required reports from specific points**
4.2	----------	----------	----------
5.0	**Psychomotor(if any)**		
5.1	----------	----------	----------

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Three Assignment**	**3,7,13**	**25**
2	**Two Regular Exams**	**5,10**	**25**
3	**Final exam**	**Final Exam week**	**50**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

At least one hour for each class

E Learning Resources

1. List Required Textbooks **Thermal Analysis of Materials,** **Robert F. Speyer**
2. List Essential References Materials (Journals, Reports, etc.) **Journal of Thermal Analysis and Calorimetry**
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. ---
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. ---

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **A lecture room with a capacity of 35 students per session is reasonable**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Data Show, White Board**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) ---

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Confidential completion of standard course evaluation survey.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • **Direct assessment: evaluation of all assessment tasks' grades for each student.** • **Indirect assessment: evaluation of student surveys.** • **Comparison of Direct and Indirect assessments**.
3. Procedures for Teaching Development **Based on direct/indirect assessments' results and confidential surveys results, improvement actions are taken (including teaching methods and strategies).**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **Possible if more than one instructor are teaching the course**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Every term the direct and indirect assessment is evaluated and accordingly effectiveness and planning for improvement can be arrangement.**

Name of Course Instructor:
Talaat Ahme Elbenawy
Signature: Talaat E **Date Completed: 31-10-2018**

Program Coordinator: Prof Mohamed Korrany

Signature: _____ **Date Received:2/11/2018**

COURSE SPECIFICATIONS

Form

Course Title: Solidification and Crystallization

Course Code: 804606–3

Date:**30–10–2018**	**Institution**: **Umm Alqura University**
College: **Engineering and Islamic Architecture** **Department**: **Mechanical Engineering**	

A. Course Identification and General Information

1. Course title and code:
Solidification and Crystallization, 804606-3

2. Credit hours:
Three Credit hours

3. Program(s) in which the course is offered:
(If general elective available in many programs indicate this rather than list programs)
Elective Course (Manufacturing & Materials Engineering Track) in Mechanical Engineering Master of Science Program.

4. Name of faculty member responsible for the course:
Dr. Talaat Ahmed Elbenawy

5. Level/year at which this course is offered:
Either level 3 or level 4

6. Pre-requisites for this course (if any):
Supervisor approved + Department

7. Co-requisites for this course (if any):

8. Location if not on main campus:
Building H (Engineering College)

9. Mode of Instruction (mark all that apply):

a. Traditional classroom	☒	percentage?	80%
b. Blended (traditional and online)	☐	percentage?	
c. E-learning	☐	percentage?	
d. Correspondence	☐	percentage?	
f. Other	☒	percentage?	20%

Comments:

B Objectives

1. The main objective of this course:

The main objective of the course is to provide students with the foundations and necessary for understanding the principles of solidification and crystallization. Students will acquire knowledge necessary for improving the material properties

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

Researches reports from both Internet and library will be frequently required from students

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

This Course analyzes solidification and crystallization processes in depth. Starting from the thermodynamic point of view, it gives a complete description, taking into account kinetics and mass transfer, down to the final structure. Importantly, the course shows the relationship between the theory and the experimental results

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Fundamentals of materials thermodynamics	**2**	**4**
Properties of interfaces	**1**	**2**
Nucleation	**1**	**2**
Crystal growth	**2**	**4**
Heat transport during solidification processes	**2**	**4**
Solidification structures	**2**	**4**
Metallic glasses and amorphous alloy melts	**2**	**4**

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	**24**	----------	----------	----------	----------	**24**
	Actual	**24**	----------	----------	----------	----------	**24**
Credit	Planned	**3**	----------	----------	----------	----------	**3**
	Actual	**3**	----------	----------	----------	----------	**3**

3. Individual study/learning hours expected for students per week. **3-5 hrs**

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Acquaintance about solidification and crystallization through understanding thermodynamics and nucleation**	**Lectures: given on topics as class progress**	- **Regular Exams** - **Final exams.**
1.2	**Acquaintance about crystallization through understanding crystal growth and heat transport during solidification**		
2.0	**Cognitive Skills**		
2.1	**Able to use knowledge of solidification and crystallization for improving materials properties**	**Extensive engineering application examples given in lectures**	**Analysis report for specific application will be required**
2.2	----------	----------	----------
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Able to Solve problems and issues in some applications**	**Giving Examples in Lectures**	**Analysis report for specific application will be required**
3.2	----------	----------	----------
4.0	**Communication, Information Technology, Numerical**		
4.1	**Able to make some scientific report work and Communicates effectively with academic recipients**	**Giving Examples in Lectures**	**Required reports from specific points**
4.2	----------	----------	----------
5.0	**Psychomotor(if any)**		
5.1	----------	----------	----------
5.2	----------	----------	----------

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Three Assignment**	**3,7,13**	**25**
2	**Two Regular Exams**	**5,10**	**25**
3	**Final exam**	**Final Exam week**	**50**
4	----------	----------	----------
5	----------	----------	----------
	----------	----------	----------

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week) **At least one hour for each class**

E Learning Resources

1. List Required Textbooks **Solidification and Crystallization Processing in Metals and Alloys, 1st Edition By Hasse Fredriksson and Ulla Åkerlind**
2. List Essential References Materials (Journals, Reports, etc.) **Metallurgical Transactions**
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. ---
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. ---

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **A lecture room with a capacity of 35 students per session is reasonable**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Data Show, White Board**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) ---

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Confidential completion of standard course evaluation survey.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • **Direct assessment: evaluation of all assessment tasks' grades for each student.** • **Indirect assessment: evaluation of student surveys.** • **Comparison of Direct and Indirect assessments**.
3. Procedures for Teaching Development **Based on direct/indirect assessments' results and confidential surveys results, improvement actions are taken (including teaching methods and strategies).**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **possible if more than one instructor are teaching the course**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. E **Every term the direct and indirect assessment are evaluated and accordingly effectiveness and planning for improvement can be arrangement.**

Name of Course Instructor:
Talaat Ahmed Elbenawy

Signature: Talaat E **Date Completed: 30-10-2018**

Program Coordinator: Prof Mohamed Korrany

Signature: _____ **Date Received: 2/11/2018**

COURSE SPECIFICATIONS

Form

Course Title: Advanced Composite Materials

Course Code: 804607-3

Date: 05–11-.2018	**Institution**: Umm-Al-Qura University….
College: Engineer Islamic Arch	**Department**: Mechanical Engineering.

A. Course Identification and General Information

1. Course title and code: Advanced **Composite Materials- 804607-3**
2. Credit hours: **3**
3. Program(s) in which the course is offered. **MSc of Mechanical Engineering**

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course **:Prof Mohamed Korrany**
5. Level/year at which this course is offered: **Levels 2, 3 or 4 / First and/or Second year**
6. Pre-requisites for this course (if any): ---
7. Co-requisites for this course (if any):--------
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	√	percentage?	90
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	√	percentage?	10

Comments: **student will asked to give short individual and / or shared presentations related to the course topics.**

B Objectives

1. **The main objective of this course**

This course will provide the MSc students with the relevant knowledge and analysis methods on advanced composite materials, properties, applications, manufacturing and testing methods

2. **Describe briefly any plans for developing and improving the course that are being implemented**. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

introduction to composite materials and advanced composite materials - describe the structure and properties of advanced composite materials - structure and properties of resins - testing methods, laminate theory - laminate orientation codes - applications of each type - overview on manufacturing processes - describe forms of fibers - modeling of the processing of fiber composites ,present the principles of engineering design including geometry and fiber directions - - fracture processes and toughness of composites. defects and maintenance.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to composite materials and advanced composite materials	2	6
Structure and properties of advanced composite materials	2	6
Applications of composite and advanced composite materials	2	6
Overview on manufacturing processes	2	6
Describe of fibre forms, laminate theory and laminate orientation codes	2	6
Presentation of the principles of engineering design including geometry and fibre directions	2	6
Defects and maintenance	1	2

2. Course components (total contact and credit hours per semester):							
		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42					42
	Actual	42					42
Credit	Planned	42					42
	Actual	42					42

3. Individual study/learning hours expected for students per week.	3

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	Understand how modern knowledge is composed and how it is applied, as well as the impact of modern research on knowledge stocks in composite materials and related professional practices on advanced composites.	• *Lectures, practical and independent study assignments.* • *Presentations on different topics.*	• *Classwork and Homework assignments.* • *Exam*
2.0	**Cognitive Skills**		
2.1	Apply continuously theoretical and practical knowledge in dealing with manufacturing of composite materials, new and unexpected obtained structures, and provide authentic and innovative responses to problems and issues related to fiber reinforced composite. Make convincing and informed judgments in situations where complete or consistent information is not available according to the type of applications.	• *Realistic Case Studies*	• *Case Studies Presentations*
3.0	**Interpersonal Skills & Responsibility**		
3.2	Ability for the students to take full responsibilities for their work, and cooperate fully and	• *Team work practical study assignments*	• *Team work reports / presentations*

	constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicates effectively and at an appropriate level with academic recipients and the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report	• *Realistic Case Studies*	• *Case Studies reports / presentations*
5.0	**Psychomotor(if any)**		
5.1	Not Applicable		

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Homework assignments	All term long	10%
2	Presentations assignments	All term long	30%
3	Case studies Presentations/Reports	12-13-14	30%
4	Exam	16	30%

D. Student Academic Counseling and Support

1. **Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)** The supervisor of student research project will guide the student in selecting the courses to study to serve in the field of the graduation project he is submitting.

E Learning Resources

1. List Required Textbooks 1 .Advanced Composite Materials, by Louis A. Pilato, Michael J. Michno, Springer- Verlag, 2004 . 2 .Introduction to Design and Analysis With Advanced Composite Materials, by Stephen R. Swanson Prentice Hall College Div, 1997 . 3. An introduction to Composite Materials, 2nd Edition, by D. Hull and T. W. Clyne, Cambridge University Press, 1996.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Classroom
2. Technology resources (AV, data show, Smart Board, software, etc.) Data show
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
3. Procedures for Teaching Development

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *By the end of each semester, improvement actions according to course report by the faculty and the students results and surveys will be conducted if required*.

Name of Course Instructor: Prof Mohamed Korrany

Signature: _____ Date Completed: 5-11-2018

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018-11-8

COURSE SPECIFICATIONS

Form

Course Title: Polymers

Course Code: 804608-3

Date: 07-11-2018.	**Institution**: Umm Al-Qura University
College: College of Engineering & Islamic Architecture **Department**: Mechanical Engineering	

A. Course Identification and General Information

1. Course title and code: **Polymers – 804608-3**
2. Credit hours: **3**
3. Program(s) in which the course is offered. **MSc of Mechanical Engineering**

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course **Dr. Dhia K. Suker**
5. Level/year at which this course is offered: **Level 3/ Second Year**
6. Pre-requisites for this course (if any):--------
7. Co-requisites for this course (if any):
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	√	percentage?	90
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	√	percentage?	10

Comments: **Students will be encouraged to work individually and in teams to accomplish the assignments required, Also to give a short presentations related to the course topics**

B Objectives

1. The main objective of this course

This course will provide the MSc students with the relevant knowledge and analysis on polymers materials, structure, general properties, applications, manufacturing and testing methods

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Introduction to polymers - describe the structure polymers – the polymerization process, crystallinity, and the glass transition temperature – service properties of polymers, mechanical, physical and chemical properties – types of polymers: thermoplastics, thermosets, and elastomers- applications of each type – additives and fillers – biodegradable plastics - describes the manufacturing processes for consumer and industrial products - describe a variety of molding operations – the characteristics of the machinery used, mold design principles and economic considerations of polymers processing –design in polymers, a fresh approach and materials selection.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introductions to polymers	1	3
The Structure of Polymers, the polymerization, crystallinity and glass transition temperature	2	6
Thermoplastics, general properties and applications	1	3
Thermosetting plastics, properties and applications	1	3
Additives and fillers in plastics	1	3
Biodegradable plastics	1	3
Elastomers (Rubbers)	1	3
Plastics forming and shaping	1	3
Extrusion and injection molding	1	3
Blow molding, rotational molding and thermoforming	1	3
Compression and transfer molding	1	3
Processing of elastomers	1	3
Mold design principles and economic considerations of polymers processing	1	3

Design in polymers, a fresh approach and materials selection	1	3

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42					42
	Actual	42					42
Credit	Planned	42					42
	Actual	42					42

3. Individual study/learning hours expected for students per week. 3

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	Understand how modern knowledge is composed and how it is applied, as well as the impact of modern research on knowledge stocks in polymers materials and related professional practices.	• *Lectures, practical and independent study assignments.* • *Presentations on different topics*	• *Classwork and Homework assignments.* • *Exams*
2.0	**Cognitive Skills**		
2.1	Apply continuously theoretical and practical knowledge in dealing with manufacturing of polymers, new and unexpected obtained structures, and provide authentic and innovative responses to problems and issues related to polymers. Make convincing and informed judgments in situations where complete or consistent information is not available according to the type of applications.	*Realistic Case Studies*	*Case Studies* *Presentations*

3.0	**Interpersonal Skills & Responsibility**		
3.2	Ability for the students to take full responsibilities for their work, and cooperate fully and constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations	*Team work practical study assignments*	*Team work reports / presentations*
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicates effectively and at an appropriate level with academic recipients and the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report	*Realistic Case Studies*	*Case Studies reports / presentations*
4.2			
5.0	**Psychomotor(if any)**		
5.1	Not applicable		
5.2			

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Homework assignments	Weekly	10%
2	Presentations assignments	Weekly	30%
3	Case studies Presentations/Reports	12-13-14	30%
4	Exam	16	30%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week) **The supervisor will advise the student in his graduation project to select the appropriate courses related to the field of his interested research.**

E Learning Resources

1. List Required Textbooks 1. Polymer Science and Technology, by Joel R. Fried, 3rd Edition, 2014 Pearson Education Inco. 2. Manufacturing Engineering and Technology, by Serope Kalpakjian, 7th Edition, 2014 Pearson Education Inco.
3. List Essential References Materials (Journals, Reports, etc.) • Any textbook similar to the given above • Students are exposed to journal materials or some articles related to the course
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. See the previous item
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Multi media associated with the textbookand the relevant websites

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **A Classroom of 15 students is sufficient for the lecture**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Data show**
1. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching • Asking students for their input during office hours • Course evaluation by students at the end of semester
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
3. Procedures for Teaching Development Sharing the experience of other instructors as the peer reviewer

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • ***By the end of each semester, improvement actions according to course report by the faculty and the student's results and surveys will be conducted if required.*** • ***The course material and learning outcomes are periodically reviewed and the changes to be taken are approved by the departmental council.***

Name of Course Instructor: Dr. Dhia K. Suker

Signature: **Date Completed: 07-11-2018**

Program Coordinator: Prof. Mohamed Korrany

Signature: _____ **Date Received:2018/11/9**

COURSE SPECIFICATIONS

Form

Course Title: - Phase Transformation

Course Code: .. 804609-3...

Date: .. 1440..–…2.–…22…	**Institution**: Umm Al-Qura University
College: College of Engineering & Islamic Architecture – Mechanical Engineering	

A. Course Identification and General Information

1. Course title and code: Phase Transformation- 804609-3

2. Credit hours: **Three hours**.

3. Program(s) in which the course is offered.

(If general elective available in many programs indicate this rather than list programs)

Master of Mechanical Engineering

4. Name of faculty member responsible for the course: Dr./ Mohammed Y. Abdellah

5. Level/year at which this course is offered:

Second semester

6. Pre-requisites for this course (if any): Material Sciences, Structure and Properties of Solids and Heat Treatment

7. Co-requisites for this course (if any):

8. Location if not on main campus:

9. Mode of Instruction (mark all that apply):

a. Traditional classroom	√	percentage?	100%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

- able to describe and comment on the science of heat treatment and phase transformation of ferrous and nonferrous alloys
- The aim of this course is to gain an understanding of the role of phase transformations on the development of microstructure and properties of metallic materials. The course will highlight a number of commercially-significant applications where phase transformations are important

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

- Increased use of supporting media might improve teaching effectiveness.
- Increase of web-based reference material through the establishment of a web-site linked to the college site and including text and exercise materials.
- The course contents will be periodically reviewed by the instructors and the Undergraduate Committee to include new materials of relevance and improved teaching method.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Nucleation in the liquid and solid states; thermodynamics of phase transformations; solidification of pure metals and alloys; thermal supercooling; constitutional supercooling; interface stability; solute redistribution; Solid state transformations: nucleation and growth of Learning Outcomes Enhanced critical thinking, analytical and problem-solving skills in materials science and engineering. An understanding of the principles underlying liquid-to solid and solid-state phase transformations in a range of materials. An understanding of the importance of phase transformations for controlling microstructure and properties in engineering alloys. interface stability; solute redistribution; Solid state transformations: nucleation and growth of phases; diffusion mechanisms; transformation kinetics; transformation diagrams. Diffusional and Diffusion less transformations: decomposition of solid solutions; ordering reactions, spinodal decomposition; eutectoid, bainitic and martensitic transformations. Aspects of ferrous metallurgy and common classes of low carbon and alloy steels to be taught illustrating some of the principles involved.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
1. Introduction	1	3
2. Thermodynamics of Phase Transformations 2.1 Gibbs Phase Rule 2.2 Ideal Solutions 2.3 Chemical Potential 2.4 Regular Solutions 2.5 Activity 2.6 Real Solutions 2.7 Equilibrium in Heterogeneous Systems 2.8 Binary Phase Diagrams 2.9 Interface Effect on Phase Equilibrium	3	9
3. Classification of Phase Transformations 3.1 Thermodynamic and Kinetic Classification	1	3
4. Interface in Solids and Their Migration 4.1 Coherent Interface 4.2 Semicoherent Interface 4.3 Incoherent Interface 4.4 Interface Migration 4.5 Migration of Non-Glissile Interface **4.6** Migration of Glissile Interface	2	6
5. Solidification 5.1 Nucleation in Pure Metals 43 5.2 Solid Phase Growth in Single-Component System 5.3 Solidification of Binary Alloys 5.4 Cellular and Dendritic Solidification	3	9
6. **Diffusional Transformations** 6.1 Precipitation 6.2 Kinetics of Diffusional Transformations 6.3 Spinodal Decomposition 6.4 continuous Transformation 6.5 Discontinuous Transformation	2	6
7. Diffusionless Transformations 7.1 Martensite in Iron Alloys 7.2 Shape Memory Effect and Super elasticity	1	3

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned						
	Actual	36	42				78
Credit	Planned						
	Actual	3					3

3. Individual study/learning hours expected for students per week. 4 hours

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

Enhanced critical thinking, analytical and problem-solving skills in materials science and engineering. An understanding of the principles underlying liquid-to solid and solid-state phase transformations in a range of materials. An understanding of the importance of phase transformations for controlling microstructure and properties in engineering alloys.

to introduce students to the basic thermodynamic, crystallographic and kinetic laws of phase transformations in engineering materials. Transformations considered vital from the engineering point of view have been demonstrated by means of practical examples. Thorough study of the text should enable the student to: - differentiate between basic types of transformations in engineering materials based on their thermodynamic, crystallographic and kinetic characteristics, - define a plausible mechanism of phase transformations occurring under given conditions during technological processing of metallic materials, - identify the basic transformation products in engineering materials. As the scope of agenda, dealing with phase transformations is very large; this textbook does not discuss all the issues defined within the syllabus profile of the subject. Any additional information can be obtained from books listed in the bibliography at the end of this textbook as needed.

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	understanding of the main subjects of phase transformation. thermal of Phase Transformations and their effect in metal physics and its application in the field of academic research specializing in mechanical engineering. And Defines the importance of Phase Diagrams in the field of materials science and engineering	• **Lectures**: given on topics as class progress, with especial consideration within the class to link the existing topic with students' existing knowledge and further with the general overview. • **Review**: review the content of each lecture and clarify any matters not understood. • **Assignments**: groups of students up to 3 are	As class/topics progress, exercises/homework are assigned. Short quizzes (20 minutes) in class are given; in addition, true/false, multiple choice item on the midterm and final exams are given.

		assigned to join in a team work; which includes solving problems in various structural members and submit reports (the work, which should be completed by week 14, involves look up of reference materials and websites). **Tutorial**: Students are invited to take a full part in discussion (each student raised a prepared question for class discussion)	
2.0	**Cognitive Skills**		
2.3	• Explains the basic definitions and terms in a phase diagram • Defines phase, equilibrium, component, degree of freedom and phase rule concepts. • Applies above mentioned concepts to the field of Materials Science and Engineering. • Relates these concepts • interprets the stability regions in unary systems by using pressure and temperature diagrams. • Defines the pressure - temperature diagrams in unary systems. • Applies the terms of phase diagrams in the unary systems which are used in materials science and engineering field. • Compares and interprets the unary systems with each others. • Composes binary systems by using unary systems. • Designs binary systems by using unary system	• Lectures • Assignments, at home • Discussions in the Class	• Quizzes • Midterm Exams • Final Exam
3.0	**Interpersonal Skills & Responsibility**		
3.2	• Punctual attendance of classes and tutorials • Student will take the responsibility to solve given assignments on their own and submit the solution. • Students learn to manage their time in self-study of the coarse materials.	• Assignment is given to the students at regular intervals for them to solve and submit. 10% of the final grade is allocated to the assignments. • Late or no submission of assignments carries penalties or loss of grade points. Participation of students in classroom discussion.	• Class attendance of students at the beginning of the lecture is recoded. • Recording of submission of assignment and the grades.

4.0	**Communication, Information Technology, Numerical**		
4.2	• Ability of the students to apply basic knowledge of mathematics in computing. • Use of computer in problem solving exercises.	Questions of tests and assignments require students' knowledge in mathematics and their computational capabilities for solving problems.	Through the students' aggregate score in all tests and assignments.
5.0	**Psychomotor(if any)**		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Performance (*Home works; 1,2 , reports and other activities*)	4	5%
2	Quiz (1)	6	5%
3	Quiz (2)	7	5%
4	Midterm exam	8	30%
5	Performance (*Home works; 3,4 and other activities*)	11	5%
6	Quiz (3)	13	5%
7	Performance (*Home works; 5 and other activities*)	14	5%
8	Final exam	16	40%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

At least two hours for each class/session

E Learning Resources

1. List Required Textbooks

Phase Transformations in Metals and Alloys (*This is the major reference for this course)*

D.A.Porter, K.E. Easterling, and M.Y. Sharif , CRC Press , Taylor & Francis Group

2. List Essential References Materials (Journals, Reports, etc.)

- Introduction to Physical Metallurgy

Sidney H. Avner McGraw Hill Education (India) Pvt Ltd

- Haasen, P.: Physikalische Metallkunde, Ed. Springer – Verlag, 1984.
- Honeycombe, R.W.K., Bhadeshia, H.K.D.H.: Steels Microstructure and Properties, Elsevier, 2006.
- Banerjee, P., Mukhopadhyay, P.: Phase Transformations, Examples from Titanium and Zirconium Alloys, Elsevier, 2007.
- Phase Transformations in Materials, G. Kostorz (Ed.), Wiley – VCH Verlag GmbH, Weinheim, 2001.

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc

- Diffusion in solids

Prof. Alok Paul , IISC Banglore

NPTEL Web course

- Phase Transformations

Prof. Anandh Subramaniam IIT Kanpur

- Phase Transformations & Heat Treatment

Prof. M.P.Gururajan ,NPTEL web course

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1 .Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc(.

- A lecture room with a capacity of 35 students per session is reasonable.

2. Technology resources (AV, data show, Smart Board, software, etc.) • An easily accessible computer lab.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching • Student course evaluation at the conclusion of the course.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Direct assessment: excel based evaluation of all assessment tasks' grades for each student. • Indirect assessment: excel based evaluation of student surveys. • Comparison of Direct and Indirect assessments.
3. Procedures for Teaching Development • Based on direct/indirect assessments' results and confidential surveys/focus group discussion results, improvement actions are taken (including teaching methods and strategies).
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) • Samples of graded examination papers and assignment tasks are check marked by an independent member teaching staff.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • Self- assessment at every two years and the external assessment by the invited faculty member at every four years will be carried out. The feedback received from these assessments will be used to plane for further improvement in the course syllabus, teaching method, and delivery of course materials.

Name of Course Instructor: Dr. Mohammed Y. Abdellah

Signature: _____ Date Completed: 4/11/2018

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received:8/11/2018

COURSE SPECIFICATIONS

Form

Course Title: Computer Aided Manufacturing; CAM

Course Code:804610

Date:6–11–2018.	**Institution**: Umm AlQura University
College: Engineering and Islamic Arch,	**Department**: Mechanical engineering

A. Course Identification and General Information

1. Course title and code: Computer Aided Manufacturing (CAM)- 804610-3
2. Credit hours:3
3. Program(s) in which the course is offered. **MSc of Mechanical Engineering**

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course: **Prof Mohamed Korrany**
5. Level/year at which this course is offered: **Levels 2, 3 or 4 / First and/or Second year**
6. Pre-requisites for this course (if any):----
7. Co-requisites for this course (if any):-----
8. Location if not on main campus:------
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	√	percentage?	90
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	√	percentage?	10

Comments: **student will asked to design individual and / or shared programers related to the course topics.**

B Objectives

1. **The main objective of this course:**

This course aim to give MSc student deep understanding on the use of computers in manufacturing as well as the use of different types, constructions, specifications of computerized numerical controlled machines (CNC). Also, applying continuously theoretical and practical knowledge in dealing with a variety of program setting, and maintain the CNC machines, CAD/CAM integration. Introducing computer integrated manufacturing (CIM).

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description: this course covers the following; operation principles of CNC machines, types of CNC machines, construction features of CNC machines, CNC operating system, CNC tooling CNC setting, CNC programming , selection of CNC machines and Manufacturing systems

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Open loop CNC system - closed loop CNC system - interpolation	1	3
CNC machine slideways - CNC machine beds	1	3
Automatic tool changer (ATC) - measuring systems for positional control - ball screw - spindle drives - feed drives - feed back devices	1	3
Fanuc operating system - Sinumeric operating system	1	3
Characteristics of tool materials - ISO designation of tools - cutter radius compensation - tool offset compensation - tool setting	1	3
Recommended machining parameters - machine homing - reference point - part origin - program origin -	1	3
Manual programming using G, and M codes - word address format - canned cycles - subroutines -	2	6
Automatically programmed tools (APT) - geometry statement - motion statements - postprocessor statements - auxiliary statements	1	3

Accuracy and repeatability of CNC machines - typical specifications of CNC machines - selection guidelines of CNC machines - trouble shooting of CNC machines - trouble shooting of machining process	1	3
CNC machine safety - maintenance of CNC machines	1	3
CAD/CAM integration - expert system in CAM - group technology	1	3
Flexible manufacturing systems(FMS)	1	3
Computer integrated manufacturing system (CIM).	1	3

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42					42
	Actual	42					42
Credit	Planned	42					42
	Actual	42					42

3. Individual study/learning hours expected for students per week. 3

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.4	Realize the recent regulations and procedures in the local and international environment that may affect the using of computer aided manufacturing. Also, realize the reasons for these changes and their future implications on CNC machines.	• *Lectures, practical and independent study assignments.* • *Presentations on different topics.*	• *Classwork and Homework assignments.* • *Exam*
2.0	**Cognitive Skills**		
2.1	Apply continuously theoretical and practical knowledge in dealing with manufacturing with the aid of computers, new and unexpected obtained programs, and provide authentic and	• *Realistic Case Studies*	• *Case Studies Presentations*

	innovative responses to problems and issues related to flexible manufacturing . Make convincing and informed judgments in situations where complete or consistent information is not available during integrated manufacturing (CIM)		
3.0	**Interpersonal Skills & Responsibility**		
3.1			
3.2	Ability for the students to take full responsibilities for their work, and cooperate fully and constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations	• *Team work practical case study assignments* • *Individual and or shared program*	• *Team work reports / presentations/ prepared program*
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicates effectively and at an appropriate level with academic recipients and the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report	• *Realistic Case Studies*	• *Case Studies reports / presentations*
5.0	**Psychomotor(if any)**		
5.1	Not applicable		

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Homework assignments	All term long	10%
2	Presentations assignments/prepared program	All term long	30%
3	Case studies Presentations/Reports	12-13-14	30%
4	Exam	16	30%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week) The supervisor of student research project will guide the student in selecting the courses to study to serve in the field of the graduation project he is submitting.

E Learning Resources

1. List Required Textbooks 1. Computer Aided Manufacturing, by C Elanchezhian, T. Sunder Selwyn, and G Shanmuga Sunder, Laxmi Publications, 2007. 2. CAD/CAM Principles and Applications, by P. N. Rao, Tata McGraw-Hill, 2004. 3. CAM Design, and Manufacturing Handbook, by Robert Norton, Industrial Press Inc., 2001.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. **Other learning material such as computer-based programs/CD, professional standards or regulations and software.** AutoCAD- inventor-solid works- Master CAD-Master CAM-CATIA

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Class room- computer labrtoray
2. Technology resources (AV, data show, Smart Board, software, etc.) Data show, software (AutoCAD- inventor-solid works- Master CAD-Master CAM-CATIA)
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
3. Procedures for Teaching Development

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *By the end of each semester, improvement actions according to course report by the faculty and the students results and surveys will be conducted if required*

Name of Course Instructor: Prof Mohamed Korrany

Signature: _____ Date Completed: 07/11/2018

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received:07/11/2018

COURSE SPECIFICATIONS

Form

Course Title: Forming and Shaping processes

Course Code: 804611-3

Date: 2018–11–1	**Institution**: Umm Al-Qura University
College: Engineering and Islamic Architecture **Department**: Mechanical Engineering	

A. Course Identification and General Information

1. Course title and code: Failure Analysis 804611-3			
2. Credit hours: 3			
3. Program(s) in which the course is offered. M.Sc. (If general elective available in many programs indicate this rather than list programs)			
4. Name of faculty member responsible for the course: Dr. Ahmed Backar			
5. Level/year at which this course is offered: Second year			
6. Pre-requisites for this course (if any):			
7. Co-requisites for this course (if any):			
8. Location if not on main campus:			
9. Mode of Instruction (mark all that apply):			
a. Traditional classroom	√	percentage?	100
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	
Comments:			

B Objectives

1. The main objective of this course

Forming and Shaping course is being arranged to create an understanding on the forming process of different materials taking into consideration the theory of material forming and shaping and the parameters affecting these processes. The students will gain the necessary knowledge to be able to select the necessary forming and shaping processes with their parameters to produce products from both metallic and composite materials. The students will be capable to distinguish between different processes based on the capabilities and limitations of each process.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

This course covers both forming theory and processes starting from the three-dimensional stresses and the yielding criteria to the different forming and shaping processes performed on both metallic and composite materials.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction / Types of stresses	1	3
3 dimensional stresses – Principal stresses	2	6
Yielding criteria – Strain Hardening	1	3
Materials forming analysis techniques (slip line – slab - Upper bound – FEM)	2	6
Formability – Forming Limit diagrams	1	3
Metal Forming Processes	3	9
Shaping of Composite Materials	3	9
Failure Analysis of Composites	2	6

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	45					45
	Actual	45					45
Credit	Planned	45					45
	Actual	45					45

3. Individual study/learning hours expected for students per week. 4

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column. **First**, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.2	Understand deeply different forming and shaping processes and the applications of each of them.	• *Lectures, practical and independent study assignments.* • *Presentations on different topics.*	• *Classwork and Homework assignments.* • *Exam*
1.3	Understand how modern knowledge is composed and how it is applied, as well as the impact of modern research on knowledge stocks in mechanical engineering and related professional practices.	• *Lectures, practical and independent study assignments.* • *Presentations on different topics.*	• *Classwork and Homework assignments.* • *Exam*
2.0	**Cognitive Skills**		
2.2	Extracts from published research or professional reports and can apply them, develops important new ideas and integrates them into their knowledge or experiences.	• *Realistic Case Studies*	• *Case Studies Presentations*
3.0	**Interpersonal Skills & Responsibility**		
3.1	Initiate the identification and creative handling of complex issues and problems in academic contexts. Act independently, when additional information or skills are needed, by searching for and applying the required information and skills.	• *Team work practical study assignments*	• *Team work reports / presentations*
4.0	**Communication, Information Technology, Numerical**		
4.2	Obtain and performs statistical and mathematical data in a critical and efficient manner. Use a wide range of appropriate information and communication technologies to examine issues and communicate findings and recommendations.	• *Case Studies*	• *Reports / presentations*
5.0	**Psychomotor(if any)**		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Homework assignments	All term long	15%
2	Presentations assignments	All term long	20%
3	Mid-term exam	7	25%
4	Final Exam	16	40%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

E Learning Resources

1. List Required Textbooks • William F. Hosford, Robert M. Caddell, "METAL FORMING Mechanics and Metallurgy", Cambridge University Press, 2007. • Andrzej Sluzalec, "Theory of Metal Forming Plasticity: Classical and Advanced Topics", Springer-Verlag Berlin Heidelberg, 2004. • Kalpakjian & Schmid,"Manufacturing Engineering and Technology", Pearson, 2013.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Classroom
2. Technology resources (AV, data show, Smart Board, software, etc.) Data show
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
3. Procedures for Teaching Development

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *By the end of each semester, improvement actions according to course report and students results and surveys will be conducted if required.*

Name of Course Instructor:
Dr. Ahmed Backar

Signature: _ Ahmed Backar _ Date Completed: __ 2 Nov. 2018 __

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 4/11/2018

COURSE SPECIFICATIONS

Form

Course Title: Finite Element Analysis and its Applications

Course Code: 804612-3

Date: 05–11-.2018	**Institution**: Umm-Al-Qura University….
College: Engineer Islamic Arch	**Department**: Mechanical Engineering.

A. Course Identification and General Information

1. Course title and code: **Finite Element Analysis and its Applications- 804612-3**
2. Credit hours: **3**
3. Program(s) in which the course is offered. **MSc of Mechanical Engineering**

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course **:Prof Mohamed Korrany**
5. Level/year at which this course is offered: **Levels 2, 3 or 4 / First and/or Second year**
6. Pre-requisites for this course (if any): ---
7. Co-requisites for this course (if any):--------
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	√	percentage?	100
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments: **student will asked to give short individual and / or shared presentations related to the course topics.**

B Objectives

1. **The main objective of this course**

To gain the MSc' student the knowledge and skills necessary to apply the finite element method in modeling and analyzing the different engineering problems.

2. **Describe briefly any plans for developing and improving the course that are being implemented**. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Discretization - concept of the finite element method - meshing - numerical integration - stiffness matrix - solutions of linear algebraic equations - boundary condition - pre and post analysis of finite element solution. - applications by using ready-made soft wares.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to finite element method	2	6
Types ,and characteristics of the different elements	2	6
Natural and local coordinates. - Jacobean - numerical integration	2	6
Element stiffness matrix - global stiffness matrix - boundary conditions -	2	6
allocations of external forces. - solution of linear algebraic equations	2	6
Evaluation of FEA solution. - representing of FEA results-remeshing techniques	2	6
Analysis of non linear problems. - analysis of dynamic problems. - modelling samples by using ready-made FE	2	6

2. Course components (total contact and credit hours per semester):

	Lecture	Tutorial	Laboratory/	Practical	Other	Total

				Studio			
Contact Hours	Planned	42					42
	Actual	42					42
Credit	Planned	42					42
	Actual	42					42

3. Individual study/learning hours expected for students per week.	6

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	Understand how modern knowledge is composed and how it is applied, as well as the impact of modern research on knowledge stocks using finite element method.	• *Lectures, practical and independent study assignments.* • *Presentations on different topics.*	• *Classwork and Homework assignments.* • *Exam*
2.0	**Cognitive Skills**		
2.1	Apply continuously finite element methods in dealing with manufacturing and thermal engineering applications. Using FEM, make convincing and informed judgments in situations where complete or consistent information is not available according to the type of applications.	• *Realistic Case Studies*	• *Case Studies Presentations*
3.0	**Interpersonal Skills & Responsibility**		
3.2	Ability for the students to take full responsibilities for their work, and cooperate fully and constructively with others when addressing issues and problems using finite element method	• *Team work practical study assignments*	• *Team work reports / presentations*
4.0	**Communication, Information Technology, Numerical**		

4.1	Communicates effectively and at an appropriate level with academic recipients and the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report	• *Realistic Case Studies*	• *Case Studies reports / presentations*
5.0	**Psychomotor(if any)**		
5.1	Not Applicable		

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Homework assignments	All term long	10%
2	Presentations assignments	All term long	30%
3	Case studies Presentations/Reports	12-13-14	30%
4	Exam	16	30%

D. Student Academic Counseling and Support

1. **Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)** The supervisor of student research project will guide the student in selecting the courses to study to serve in the field of the graduation project he is submitting.

E Learning Resources

List Required Textbooks 1.The Finite Element Method in Engineering Science, by O. C. Zienkiewicz, McGraw-Hill, 1971 . 2.Finite Element Programming, by E. Hinton, and D. R. J. Owen, Academic Press 1977 . 3.Finite Element Modeling in Engineering Practice, by Constantine C. Pyrakos, Algor, Incorporated 1996. 4. Matlab Guide to Finite Elements: An interactive Approach, by Peter Kattan, Springer 2006.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Classroom
2. Technology resources (AV, data show, Smart Board, software, etc.) Data show
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department

3. Procedures for Teaching Development
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *By the end of each semester, improvement actions according to course report by the faculty and the students results and surveys will be conducted if required*.

Name of Course Instructor: Prof Mohamed Korrany

Signature: _____ Date Completed: 14-11-2018

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018-11-15

COURSE SPECIFICATIONS

Form

Course Title: - Mechanical Behavior of Engineering Material

Course Code: .. 804613-3...

Date: .. 1440..–…2.–…22…	**Institution**: Umm Al-Qura University
College: College of Engineering & Islamic Architecture – Mechanical Engineering	

A. Course Identification and General Information

1. Course title and code: Mechanical Behavior of Engineering Materials- 804613-3

2. Credit hours: **Three hours**.

3. Program(s) in which the course is offered.

(If general elective available in many programs indicate this rather than list programs)

Master of Mechanical Engineering

4. Name of faculty member responsible for the course: Dr./ Mohammed Y. Abdellah

5. Level/year at which this course is offered:

Second semester

6. Pre-requisites for this course (if any): mechanics of material, material testing

7. Co-requisites for this course (if any):

8. Location if not on main campus:

9. Mode of Instruction (mark all that apply):

a. Traditional classroom	√	percentage?	100%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

The central theme of this course is the mechanical behavior of engineering materials, such as metals, ceramics, polymers, and composites, subjected to different types of loading. The main objectives are to provide students with basic understanding of phase transformation by heat treating and stress-induced hardening, linear and nonlinear elastic behavior, deformation under multiaxial loading, plastic deformation and yield criteria, dislocation plasticity and strengthening mechanisms, creep, stress concentration effects, brittle versus ductile fracture, fracture mechanisms at different scales, fatigue, contact deformation, and wear.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

- Increased use of supporting media might improve teaching effectiveness.
- Increase of web-based reference material through the establishment of a web-site linked to the college site and including text and exercise materials.
- The course contents will be periodically reviewed by the instructors and the Undergraduate Committee to include new materials of relevance and improved teaching method.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Phenomenology of mechanical behavior of materials at the macroscopic level. Relationship of mechanical behavior to material structure and mechanisms of deformation and failure. Topics include: elasticity, viscoelasticity, plasticity, creep, fracture, and fatigue. Case studies and examples drawn from a variety of classes of materials including: metals, ceramics, polymers, thin films, composites, and cellular materials. The course will focus on the design and processing of materials from the atomic to the macroscale to achieve desired mechanical behavior. The course is also focused on mechanical behavior of soft matter including cells, using state of the art atomic force microscopy and nano-indentation tools. Another area of investigation is in the field of combinatorial materials testing that encompasses simultaneous materials characterization along with testing to provide in-situ knowledge of the underlying micro-mechanisms of deformation

1. Topics to be Covered		
List of Topics	**No. of Weeks**	**Contact hours**
1. Introduction introduction to deformation behavior: Concept of stresses and strains, engineering stresses and strains, Different types of loading and temperature encountered in applications, Tensile Test - stress - strain response for metal, ceramic and polymer, elastic region, yield point, plastic deformation, necking and fracture, Bonding and Material Behaviour, theoretical estimates of yield strength in metals and ceramics.	1.5	5
2. Elasticity Theory The State of Stress and strain, stress and strain tensor, tensor transformation, principal stress and strain, elastic stress-strain relation, anisotropy, elastic behaviour of metals, ceramics and polymers.	1.5	5
3. Yielding and Plastic Deformation: Hydrostatic and Deviatoric stress, Octahedral stress, yield criteria and yield surface, texture and distortion of yield surface, Limitation of engineering strain at large deformation, true stress and true strain, effective stress, effective strain, flow rules, strain hardening, RambergOsgood equation, stress - strain relation in plasticity, plastic deformation of metals and polymers	3	9
4. Microscopic view of plastic deformation crystals and defects, classification of defects, thermodynamics of defects, geometry of dislocations, slip and glide, dislocation generation - Frank Read and grain boundary sources, stress and strain field around dislocations, force on dislocation - self-stress, dislocation interactions, partial dislocations, twinning, dislocation movement and strain rate, deformation behavior of single crystal, critical resolved shear stress (CRSS), deformation of poly-crystals - Hall-Petch and other hardening mechanisms, grain size effect - source limited plasticity, Hall-Petch breakdown, dislocations in ceramics and glasses	3	9
5. Fracture fracture in ceramics, polymers and metals, different types of fractures in metals, fracture mechanics - Linear fracture mechanics -KIC, elasto-plastic fracture mechanics - JIC, Measurement and ASTM standards, Design based on fracture mechanics, effect of environment, effect of microstructure on KIC and JIC, application of fracture mechanics in the design of metals, ceramics and polymers.	2	5
6. Deformation under cyclic load – Fatigue S-N curves, Low and high cycle fatigue, Life cycle prediction, Fatigue in metals, ceramics and polymers.	1	2

7. Deformation at High temperature Time dependent deformation - creep, different stages of creep, creep and stress rupture, creep mechanisms and creep mechanism maps, creep under multi-axial loading, microstructural aspects of creep and design of creep resistant alloys, high temperature deformation of ceramics and polymers.	2	6

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned						
	Actual	41	42				83
Credit	Planned						
	Actual	3					3

3. Individual study/learning hours expected for students per week. 4 hours

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

- Gain practical experience in measurement and quantification of mechanical properties.
- Understand the physical and microstructure basis of mechanical properties. – Become familiar with failure mechanisms of structural materials.
- Ability to predict the useful lifetime of a material under specific load conditions.
- Knowledge of how to incorporate material strength limitations into engineering design.
- Ability to determine states of stress in three dimensions.
-

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map			
Code #	**NQF Learning Domains And Course Learning Outcomes**	**Course Teaching Strategies**	**Course Assessment Methods**
1.0	**Knowledge**		
1.4	Ability to apply constitutive laws to solve deformable body problems – Ability to formulate problems involving multi-dimensions and apply failure theories And Recognition of failure mechanisms and identify key mechanical properties and analyses and/or experiments needed to determine cause of failure and evaluate solutions to prevent failure	• **Lectures**: given on topics as class progress, with especial consideration within the class to link the existing topic with students' existing knowledge and further with the general overview. • **Review**: review the content of each lecture and clarify any matters not understood. • **Assignments**: groups of students up to 3 are assigned to join in a team work; which includes solving problems in various structural members and submit reports (the work, which should be completed by week 14, involves look up of reference materials and websites). **Tutorial**: Students are invited to take a full part in discussion (each student raised a prepared question for class discussion)	As class/topics progress, exercises/homework are assigned. Short quizzes (20 minutes) in class are given; in addition, true/false, multiple choice item on the midterm and final exams are given.
2.0	**Cognitive Skills**		
2.1	• Gain practical experience in measurement and quantification of mechanical properties. • Understand the physical and microstructure basis of mechanical properties. – Become familiar with failure mechanisms of structural materials. • Ability to predict the useful lifetime of a material under specific load conditions. • Knowledge of how to incorporate material strength limitations into engineering design. • Ability to determine states of stress in three dimensions.	• Lectures • Assignments, at home • Discussions in the Class	• Quizzes • Midterm Exams • Final Exam

3.0	**Interpersonal Skills & Responsibility**		
3.2	• Student should be creative handling of complex models and problems • the ability to identify, formulate, and solve problems related to the behavior of engineering materials • Students learn the importance of the strength of materials in various engineering disciplines, specifically the design of large- and small-scale mechanical components. • Student learn to initiate the identification of complex models and problems • Try to search about the solution on other material to improve their skills	• Assignment is given to the students at regular intervals for them to solve and submit. 10% of the final grade is allocated to the assignments. • Late or no submission of assignments carries penalties or loss of grade points. Participation of students in classroom discussion.	• Class attendance of students at the beginning of the lecture is recoded. • Recording of submission of assignment and the grades.
4.0	**Communication, Information Technology, Numerical**		
4.2	• Obtain and performs statistical and mathematical data in a critical and efficient manner. • obtain engineering and communication skills, and use methods and mechanical testing approaches for engineering practice • a recognition of the need for, and an ability to engage in life-long learning • an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. • Use a wide range of appropriate information and communication technologies to examine issues and communicate findings and recommendations.	Questions of tests and assignments require students' knowledge in mathematics and their computational capabilities for solving problems.	Through the students' aggregate score in all tests and assignments.
5.0	**Psychomotor(if any)**		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Performance (*Home works; 1,2 , reports and other activities*)	4	5%
2	Quiz (1)	6	5%
3	Quiz (2)	7	5%
4	Midterm exam	8	30%
5	Performance (*Home works; 3,4 and other activities*)	11	5%
6	Quiz (3)	13	5%
7	Performance (*Home works; 5 and other activities*)	14	5%
8	Final exam	16	40%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week) At least two hours for each class/session

E Learning Resources

1. List Required Textbooks • Thomas H. Courtney, Mechanical Behavior of Materials, 2nd Edition (Waveland Press, 2000). ISBN: 978-1-57766-425-3 2. N.E. Dowling, • Mechanical Behavior of Materials, 3rd Edition, Pearson Prentice Hall, 2007
2. List Essential References Materials (Journals, Reports, etc.) • G.E. Dieter,"Mechanical Metallurgy", McGraw-Hill, 1986. 2. R.W. • Hertzberg,"Deformation and Fracture Mechanics of Engineering Materials", John Wiley and Sons, 1976.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1 .Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc(. • A lecture room with a capacity of 35 students per session is reasonable.
2. Technology resources (AV, data show, Smart Board, software, etc.) • An easily accessible computer lab.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching • Student course evaluation at the conclusion of the course.

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department

- Direct assessment: excel based evaluation of all assessment tasks' grades for each student.
- Indirect assessment: excel based evaluation of student surveys.
- Comparison of Direct and Indirect assessments.

3. Procedures for Teaching Development

- Based on direct/indirect assessments' results and confidential surveys/focus group discussion results, improvement actions are taken (including teaching methods and strategies).

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)

- Samples of graded examination papers and assignment tasks are check marked by an independent member teaching staff.

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.

- Self- assessment at every two years and the external assessment by the invited faculty member at every four years will be carried out. The feedback received from these assessments will be used to plane for further improvement in the course syllabus, teaching method, and delivery of course materials.

Name of Course Instructor: Dr. Mohammed Y. Abdellah

Signature: _____ Date Completed: 2018/11/2

Program Coordinator: Prof Mohamed Korrany
Signature: _____ Date Received: 4/11/2018

COURSE SPECIFICATIONS

Form

Course Title: Fault Diagnosis

Course Code: 804614-3

Date: 2018–11–1	**Institution**: Umm Al-Qura University
College: Engineering and Islamic Architecture **Department**: Mechanical Engineering	

A. Course Identification and General Information

1. Course title and code: Fault Diagnosis 804614-3
2. Credit hours: 3
3. Program(s) in which the course is offered. M.Sc.

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course: Dr. Ahmed Fathi
5. Level/year at which this course is offered: Second year
6. Pre-requisites for this course (if any):
7. Co-requisites for this course (if any):
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	√	percentage?	100
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

Machine fault diagnosis is a procedure used to determine the root cause of equipment failure. This is a branch of mechanical engineering, which undertakes the study of designing, building, and maintaining machines for activities ranging from medical imaging to industrial production. When complex machinery fails, replacing the component involved might not be enough, because this may not address the underlying reason for the problem. Instead, a full machine fault diagnosis provides information about precisely what happened and how to address it, preventing similar failures in the future. For instance, a seal might not be tight, leading to leakage inside the equipment. The root cause might be normal wear and tear, with the seal at the end of its natural life. It could also be the result of poor installation, migration of another part that rubs against the seal, or another problem inside the equipment. The main objective of this course is to introduce the students to a number of tools and techniques used in machine fault diagnosis. These tools can allow for the collection of a variety of pieces of information that may help explain a fault.

Course Objective

- To understand the reasons for faults and their impact on mechanical systems.
- To learn about the various approaches in the use of Expert methods for the Diagnosis of System Faults.
- To identify how Expert methods and techniques can be applied on mechanical systems to improve their overall reliability.
- To apply fault diagnosis and fault tolerant control.
- To learn how to monitor vibration and other characteristics while equipment is in operation, analyze components and lubricants from the machine, and use thermal analysis to look for hot spots.

Learning Outcomes

Upon successful completion of this unit, students will be able to:

- Analyze the free and hormonally excited vibratory systems.
- Use Fast Fourier Transform (FFT) to study the system performance with periodic excitation.
- Classify transducers for vibration measurement.
- Identify problems of vibration measurements and analysis: FFT analyzer, filtering, sampling, aliasing, averaging, windowing.
- Distinguish between the four maintenance categories.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

- Update the course content periodically.
- Using latest references.
- Using the electrical analogies.
- Using web references.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

1. Topics to be Covered		
List of Topics	**No. of Weeks**	**Contact hours**
Chapter 1: Introduction to Fault Diagnosis General Introduction, Terminology and Definitions, Background and Motivation.	1	3
Free and Forced Vibration	2	6
Fourier Series	1	3
Vibration Measuring Instruments	1	3
Conditioning Monitoring	1	3
Techniques of Fault Diagnosis	2	6
Equipment Overview	1	3
Machinery Fault Diagnosis using Vibration Analysis	3	9
Time Domain Fault Indicators	2	6

2. Course components (total contact and credit hours per semester):							
		Lecture	**Tutorial**	**Laboratory/ Studio**	**Practical**	**Other**	**Total**
Contact Hours	Planned	42					42
	Actual	42					42
Credit	Planned	42					42
	Actual	42					42

3. Individual study/learning hours expected for students per week.	3

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	To apply the fundamental principles of science and engineering.	• *Lectures, practical and independent study assignments.* • *Presentations on different topics.*	*Written exams, homework*

1.2	To gain capability to communicate effectively.		
1.3	To achieve ability to work effectively as an individual, and as a member/leader in a team.		
2.0	**Cognitive Skills**		
2.1	The ability to perform an analysis to find out what happened after an incident involving faulty equipment.	• *1. Making connections between different concepts across the domains.* • *Assigning research questions that can be answered through collecting and analysing data.* • *Class discussions.* • *Using the Internet to create learning activities*	• *Discussing and evaluating the topics that students learn from their textbooks and other sources.* • *Quizzes and Exams.*
2.2	The ability to perform on-going machine fault diagnosis, which can be used to monitor systems in operation for signs of problems.		
2.3	The ability to analyse data collected using Condition Monitoring techniques such as vibration measurements and AE techniques and document it.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Developing oral presentations	• *Debates* • *Workshops using technology application tools including Microsoft office for writing and publishing.*	• *Team work reports / presentations* • *Instructor's feedback*
3.2	Communicating personal ideas and thoughts.		
3.3	Responding to class discussions.		
3.4	Developing teamwork skills.		
3.5	Presenting reports on their reading.		
4.0	**Communication, Information Technology, Numerical**		
4.1	The essential components of communication skills are based on developing critical skills, observation, and feedback.	• *Group discussion* • *Forming teams to do assignments*	• *Providing opportunities for observed practice.* • *Providing feedback.* • *Encouraging self-assessment during the learning process.*
4.2	Encouraging students to use online resources.		
4.3	Using the Internet to collect data.		
5.0	**Psychomotor(if any)**		
5.1	N/A	N/A	N/A
5.2	N/A	N/A	N/A

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Homework assignments	All term long	10%
2	Presentations assignments	All term long	20%
3	Class discussions	All term long	10%
4	2 Follow up Exams	Week 6,12	20%
4	Exam	16	30%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

E Learning Resources

1. List Required Textbooks • *Practical Machinery Vibration Analysis and Predictive Maintenance, Scheffer and Gridhar, 1 edition (July 16, 2004)* • *Machinery Vibration: Measurement and Analysis, Victor Wowk, McGraw-Hill, Inc., 1991.* • *Machinery Vibration: Balancing, Victor Wowk, McGraw-Hill, Inc., 1995.*
2. List Essential References Materials (Journals, Reports, etc.)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Classroom
2. Technology resources (AV, data show, Smart Board, software, etc.) Data show
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
3. Procedures for Teaching Development
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.

By the end of each semester, improvement actions according to course report and students results and surveys will be conducted if required.

Name of Course Instructor:
Dr. Ahmed Fathi

Signature: _ Ahmed Fathi _ Date Completed: __ 5 Nov. 2018 __

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 14/11/2018

COURSE SPECIFICATIONS

Form

Course Title: Failure Analysis

Course Code: 804615-3

Date: 2018–11–1	**Institution**: Umm Al-Qura University
College: Engineering and Islamic Architecture **Department**: Mechanical Engineering	

A. Course Identification and General Information

1. Course title and code: Failure Analysis 804615-3
2. Credit hours: 3
3. Program(s) in which the course is offered. M.Sc.

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course: Dr. Ahmed Backar
5. Level/year at which this course is offered: Second year
6. Pre-requisites for this course (if any):
7. Co-requisites for this course (if any):
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	√	percentage?	100
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

Failure Analysis course is being arranged to create an understanding on how and why materials fail and factors that contribute to such failures. It bridges a gap between theoretical concepts and their application in field. Failure Analysis is an important engineering function that can occur due to a variety of reasons

- Design errors
- Improper material
- Improper manufacturing process
- Unforeseen operating conditions
- Improper maintenance

A thorough understanding of Material failures can enable engineers to improve on their design, manufacturing and maintenance practices. Purpose of this course is to equip engineers with adequate understanding of this subject so that they can efficiently apply their engineering knowledge on practical cases they encounter in field / industry. With the understanding of this subject, engineers can improve their design / manufacturing and maintenance procedures to provide a better and safer product to their clients.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

This course covers three principal areas of interest: Procedures for Analysis, Failure Mechanisms and Failure in Product Forms and Components. Causes of failures are explained for different materials with reference to different working conditions. Case studies of failures and their elimination are highlighted throughout the course.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction / tools for the analysis of Mechanical Failure	2	6
Mechanisms of Damage and Failure	1	3
Mechanical aspects and tests	1	3
Fracture Mechanisms	1	3
Failure modes (Tensile, torsion, bending, fatigue, corrosion)	3	9
Failure Analysis of Composites	2	6
Case Studies	4	12

2. Course components (total contact and credit hours per semester):							
		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42					42
	Actual	42					42
Credit	Planned	42					42
	Actual	42					42

3. Individual study/learning hours expected for students per week.	3

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.2	Understand deeply different failure analysis techniques and the application of them.	• *Lectures, practical and independent study assignments.* • *Presentations on different topics.*	• *Classwork and Homework assignments.* • *Exam*
2.0	**Cognitive Skills**		
2.3	Plan and execute large projects or part of scientific research independently, applying his theoretical and practical knowledge and using research methods to arrive at valuable conclusions that lead to important additions to current knowledge or professional practices.	• *Realistic Case Studies*	• *Case Studies Presentations*
3.0	**Interpersonal Skills & Responsibility**		
3.2	Ability for the students to take ful responsibilities for their work, and cooperate fully and constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations	• *Team work practical study assignments*	• *Team work reports / presentations*
4.0	**Communication, Information Technology, Numerical**		

4.2	Ability to Collect failure cases data and perform the necessary statistical and mathematical analysis in a critical and efficient manner. Use a wide range of appropriate information and communication technologies to examine issues and communicate findings and recommendations	• *Realistic Case Studies*	• *Case Studies reports / presentations*
5.0	**Psychomotor(if any)**		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Homework assignments	All term long	10%
2	Presentations assignments	All term long	30%
3	Case studies Presentations/Reports	12-13-14	30%
4	Exam	16	30%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

E Learning Resources

1. List Required Textbooks Charles R. Brooks and Asok Choudhury, "Failure Analysis of Engineering Materials", McGraw Hill, 2002 Jose Luis Otegui, "Failure Analysis: Fundamentals and Applications in Mechanical Components", Springer, 2014.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Classroom
2. Technology resources (AV, data show, Smart Board, software, etc.) Data show
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
3. Procedures for Teaching Development

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *By the end of each semester, improvement actions according to course report and students results and surveys will be conducted if required.*

Name of Course Instructor:
Dr. Ahmed Backar

Signature: _ Ahmed Backar _ Date Completed: __ 2 Nov. 2018 __

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received:2018/11/4

COURSE SPECIFICATIONS

Form

Course Title: Optimization methods in Manufacturing

Course Code: 804616-3

Date: 1–11–2018	**Institution**: Umm Al-Qura University
College: College Engineering and Islamic Architecture **Department**: Mechanical Engineering	

A. Course Identification and General Information

1. Course title and code: Optimization methods in Manufacturing 804616-3
2. Credit hours: 3
3. Program(s) in which the course is offered. elective

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course: Mohamed Sayed El-Ashhab
5. Level/year at which this course is offered: Fifth level
6. Pre-requisites for this course (if any): Nothing
7. Co-requisites for this course (if any): Nothing
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	Y	percentage?	60
b. Blended (traditional and online)	Y	percentage?	40
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

This course will introduce the basic Optimization methods in Manufacturing concepts and tools. It will give an understanding about how to apply these concepts and tools at different manufacturing systems.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description: Upon completion of the course, students will have:
1. Describe clearly a problem, identify its parts and analyze the individual functions.
2. Feasibility study for solving an optimization problem
3. Becoming a mathematical translation of the verbal formulation of an optimization problem.
4. To design algorithms, the repetitive use of which will lead reliably to finding an approximate solution
5. Evaluate and measure the performance of an algorithm.
6. Discovery, study and solve optimization problems.
7. Understand optimization techniques using algorithms.
8. Investigate, study, develop, organize and promote innovative solutions for various applications.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction, local and total Optimization, Mathematical Background	1	3
Fundamental concepts of optimization.	2	6
Optimize absence of restrictions	1	3
Optimization with restrictions	1	3
Total Optimization Techniques	2	6
Global search algorithms.	1	3
Genetic Algorithms.	2	6
Metaheuristic	1	3
Applications using Evolver.	2	6
Implementation Laboratory exercises and project using MATLAB software	2	6

2. Course components (total contact and credit hours per semester):

	Lecture	Tutorial	Laboratory/	Practical	Other	Total

				Studio			
Contact Hours	Planned	30		15			45
	Actual	30		15			45
Credit	Planned	3					3
	Actual	3					3

3. **Individual** study/learning hours expected for students per week.	3

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Understand the Fundamental concepts of optimization.	Lectures	Quiz and discussion
1.2	Differentiate between optimization with or without restrictions	Lectures	Quiz and discussion
2.0	**Cognitive Skills**		
2.1	Use of Matlab and Evolver to formulate and solve optimization problems	Lectures and labs	Small projects
2.2	Use genetic algorithms and Metaheuristic techniques	Lectures and labs	Small projects
3.0	**Interpersonal Skills & Responsibility**		
3.1			
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicate and use techniques and modern optimization tools.	Lectures and labs	Reports and presentations
4.2			
5.0	**Psychomotor(if any)**		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Homework		20 %
2	Class Participation		25 %

3	Midterm exam		25 %
4	Final exam		30 %
5			

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week) 4 office hours

E Learning Resources

1. List Required Textbooks • Applied Optimization with MATLAB programming, WILEY , 2009. • Mitchell, M. (1998). An introduction to genetic algorithms. MIT press.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Evolver and MatLab

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) According to the number of registered students
2. Technology resources (AV, data show, Smart Board, software, etc.) Data show, and Evolver and MatLab software's
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching Faculty survey
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department Exams and Discussions
3. Procedures for Teaching Development
4. Procedures for Verifying Standards of Student's Achievement Check marking by an independent member teaching staff of a sample of student's work

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.
The course will be Annually reviewed and revised if needed

Name of Course Instructor: Associate Professor \ Mohamed Sayed El-Ashhab
Signature: _____ Date Completed: _____

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 25/11/2018

COURSE SPECIFICATIONS

Form

Course Title: Quality and Reliability

Course Code: 804617-3

Date: 1–11–2018	**Institution**: Umm Al-Qura University
College: College Engineering and Islamic Architecture **Department**: Mechanical Engineering	

A. Course Identification and General Information

1. Course title and code: Quality and Reliability 804617-3
2. Credit hours: 3
3. Program(s) in which the course is offered. elective

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course: Mohamed Sayed El-Ashhab
5. Level/year at which this course is offered: *****
6. Pre-requisites for this course (if any): Nothing
7. Co-requisites for this course (if any): Nothing
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	Y	percentage?	70
b. Blended (traditional and online)	Y	percentage?	30
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

This course will introduce the basic reliability concepts and tools. It will give an understanding about how to apply these concepts and tools at different phases of systems' life cycle.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description: An integrated analysis of the quality control and reliability functions in manufacturing. Statistical process control, acceptance sampling, process capability analysis, reliability prediction, Failure modes effects and analysis and maintainability, availability, and safety are discussed. This Course dealt with the methods of reliability allocation, prediction, and mathematical expressions for the most common distributions. Also, both simple and complex systems Effectiveness are analyzed.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to Quality Engineering	2	6
Review of Probability and Statistics	2	6
The Role of Quality Engineering in Design and Manufacturing	2	6
Acceptance Sampling	2	6
Reliability Engineering	4	12
Maintainability Engineering	1	3
Availability Engineering	1	3

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30		12			
	Actual						
Credit	Planned	3					
	Actual						

3. Individual study/learning hours expected for students per week. 3

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1			
1.2			
2.0	**Cognitive Skills**		
2.1			
2.2			
3.0	**Interpersonal Skills & Responsibility**		
3.1			
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1			
4.2			
5.0	**Psychomotor(if any)**		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Homework		20 %
2	Class Participation		15 %
3	Midterm exam		25 %
4	Final exam		40 %
5			
6			
7			
8			

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week) 4 office hours

E Learning Resources

1. List Required Textbooks • M. S. Al-Ashhab, Analysis of System Effectiveness: Reliability, Availability and Capability, LAP LAMBERT Academic Pupblishing. 2016 • Krishnamoorthi, K.S. "A First Course in Quality Engineering", Prentice Hall, 2006.Blanchard & Lowery, "Maintainability", McGraw-Hill, 1969. • Juran & Gryna, "Quality Planning and Analysis", McGraw-Hill, 1980. • O'Connor, P. "Practical Reliability Engineering", Wiley, 1985.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. BlockSim

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) According to the number of registered students
2. Technology resources (AV, data show, Smart Board, software, etc.) Data show, and BlockSim software
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching Faculty survey
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department Exams and Discussions
3. Procedures for Teaching Development
4. Procedures for Verifying Standards of Student's Achievement Check marking by an independent member teaching staff of a sample of student's work

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.
The course will be Annually reviewed and revised if needed

Name of Course Instructor: Associate Professor \ Mohamed Sayed El-Ashhab
Signature: _____ Date Completed: _____

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 15/11/2018

COURSE SPECIFICATIONS

Form

Course Title: Operations Research and Optimizing

Course Code: 804618-3

This is according to the comments of reviewers 1 and 3 :Commented [m@1]

Date: 23-10-2018.	**Institution**: Umm Al-Qura University
College: Engineering and Islamic Architecture **Department**: Mechanical Engineering	

A. Course Identification and General Information

1. Course title and code: Operations Research and Optimizing 804618-3

This is according to the comments of reviewers 1 and 3 **:Commented [m@2]**

2. Credit hours: 3

3. Program(s) in which the course is offered. M.Sc. in Mechanical Engineering

(If general elective available in many programs indicate this rather than list programs)

4. Name of faculty member responsible for the course Professor: Dr. Muhammad N. Radhwi

5. Level/year at which this course is offered: Fifth level

6. Pre-requisites for this course (if any): M. Sc. Status

7. Co-requisites for this course (if any): none

8. Location if not on main campus: Main campus

9. Mode of Instruction (mark all that apply):

a. Traditional classroom	✓		percentage?	100
b. Blended (traditional and online)			percentage?	
c. E-learning			percentage?	
d. Correspondence			percentage?	
f. Other			percentage?	

Comments:

B Objectives

1. The main objective of this course

- Able to use knowledge of operations research models in solving, designing and optimizing mechanical engineering systems.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description: Linear Programming Models - Simplex Algorithm - Duality and Sensitivity - Non-Linear Programming Models - Queuing Models - Simulation Models

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
1. Linear Programming Models: feasible solutions and types.	2	6
2. Simplex Algorithm: Standard LP model formulation, Simplex optimized solutions, Big M method, Two-phase simplex method.	4	12
3. Duality and Sensitivity: Dual/primal of LP models, Sensitivity analysis.	2	6
4. Non-Linear Programming Models: Convex/concave functions, solving NLP's with single variable, unconstrained NLP optimization, Lagrange Multiplier.	3	9
5. Queuing Models: Birth-death processes, single server limited/non-limited waiting system, multiple server limited/non-limited waiting system	3	9
6. Simulation Models: Stochastic simulation, discrete-event simulation, Monte Carlo simulation.	2	6

2. Course components (total contact and credit hours per semester):							
		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	48					48
	Actual	48					48
Credit	Planned	3					3
	Actual	3					3

3. Individual study/learning hours expected for students per week. 6 hours

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Deep understanding of concepts, principles and theories of linear programming models including feasibility of simplex optimized solutions, duality and sensitivity.	• Lectures: given on topics as class progress, with especial consideration within the class to link the existing topic with students' existing knowledge and further with the general overview. • Review: review the content of each lecture and clarify any matters not clear to make sure comprehensive and deep understanding of the topics concepts, principles, theories and applications to local as well as global	As class/topics progress, assignments/homework are assigned and fill-in-blank knowledge items on the midterm and final exams are given.
1.2	Deep understanding of concepts, principles and theories of non-linear programming models, queuing models and simulation models.		

		environments in the field of mechanical engineering.	
1.3	Able to perform a real life case study solutions project in mechanical systems including modern knowledge application and realization to recent regulations/procedures locally as well as internationally.	Real life Case Study Project: Small groups of students (around 4) are assigned to join in a team work; which includes selecting a real life case study project proposed by team members, perform and continue to cover the project in parallel to related class lectures, present weekly updates, present the final work to class and submit the final professional report (the work, which should be completed by week 15, involves generating/collecting data, look up of reference materials, websites and use of computing analysis software).	Each student required to present periodic updates and the final work of the project to class (five updates and a final presentation, involves students actual contribution to the project and reflecting his independent research abilities). In addition, a final professional report of the project for the team work is submitted at the end of the term.
2.0	**Cognitive Skills**		
2.1	Ability to apply continuously theoretical/practical knowledge of operations research modeling concepts/techniques in solving mechanical engineering problems in an integrated knowledge/experience environment and in a variety of context.	• Extensive engineering application examples given in lectures along with class materials as class progress. • Learning encouraged by use of analytical tools in different applications and through discussion of potential application in other areas. • Assignment tasks include some open ended tasks designed to use real life data, reference materials and apply predictive, analytical and problem solving approach.	• Problem solving questions are given at the end of each topic, on midterm exam and on end of semester final examination. • Real life Case Study Project requires application of analytical tools in problem solving tasks in a variety of contexts.
2.2	Able to perform large-scale scientific work independently by applying students' knowledge/experience.		

3.0	**Interpersonal Skills & Responsibility**		
3.1			
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1	Ability to communicate and use techniques and modern engineering tools effectively using real life data analysis and operations research concept/information.	In the real life case study, students required to make periodic updates, a full scale final presentation of the work to class and submit a written professional report, which require proper style and referencing format as specified in graduate study manual.	Assessments of students assignment work include expectation of adequate use of numerical and communication skills, in addition to interpretation of collected data and information.
4.2			
5.0	**Psychomotor(if any)**		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Real life case study Project update 1	3	2%
2	Real life case study Project update 2	6	2%
3	Mid-Term Test	8	15%
4	Real life case study Project update 3	9	2%
5	Real life case study Project update 4	12	2%
6	Real life case study Project update 5	14	2%
7	Final Presentation for the Real life case study Project	15	10%
8	Final Professional Report for the Real life case study Project	15	30%
9	Final Test	16	35%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week): At least an hour for each class/session.

E Learning Resources

1. List Required Textbooks • Winston, W. L., Operations Research: Applications and Algorithms, fourth Edition, Duxbury Press, 2003.
2. List Essential References Materials (Journals, Reports, etc.) • Operations Research: An Introduction, ninth Edition, by Taha, H. A., Prentice Hall, 2011. • Optimization Modeling with Spreadsheets, 2nd Edition, by Baker, K. R., John Wiley & Sons, 2011.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) • A lecture room with a capacity of 35 students per session is reasonable.
2. Technology resources (AV, data show, Smart Board, software, etc.) • Computer access of a PC with Microsoft office installed.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching • Confidential completion of standard course evaluation survey. • Focus group discussion with small (as well as large) groups of students.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Direct assessment: evaluation of all assessment tasks' grades for each student. • Indirect assessment: evaluation of student surveys. • Comparison of Direct and Indirect assessments.

3. Procedures for Teaching Development • Based on direct/indirect assessments' results and confidential surveys/focus group discussion results, improvement actions are taken (including teaching methods and strategies).
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) • Samples of graded examination papers and assignment tasks are check marked by an independent member teaching staff.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • Periodic peer review feedback on the quality of the course are conducted and planned remedial/improvements' actions are taken.

Name of Course Instructor: Professor Dr. Muhammad N. Radhwi
Signature: _____ Date Completed: October 31, 2018

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2/11/2018

COURSE SPECIFICATIONS

Form

Course Title: Nanomaterials and their Advanced Applications

Course Code: 804633-3

Date: 10–11-.2018	**Institution**: Umm-Al-Qura University….
College: Engineer Islamic Arch	**Department**: Mechanical Engineering.

A. Course Identification and General Information

1. Course title and code: **Nanomaterials and their Advanced Applications - 804633-3**
2. Credit hours: **3**
3. Program(s) in which the course is offered. **MSc of Mechanical Engineering**

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course **:Prof Mohamed Korrany**
5. Level/year at which this course is offered: **Levels 2, 3 or 4 / First and/or Second year**
6. Pre-requisites for this course (if any): ---
7. Co-requisites for this course (if any):--------
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	√	percentage?	80
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	√	percentage?	20

Comments: **student will asked to give short individual and / or shared presentations related to the course topics.**

B Objectives

1. **The main objective of this course**

This course will teach and train the MSc students to have in-depth fundamental knowledge in nanomaterials and have the capability to design and synthesis new nanomaterials. Also, will provide the relevant knowledge and analysis methods on mechanical properties and advanced applications of nanomaterials.

2. **Describe briefly any plans for developing and improving the course that are being implemented**. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

This course will cover the following topics: introduction to nanomaterials – Classification of nanomaterials- describe the structure, physical and chemical properties of nanomaterials - Mechanical and thermal properties of nanomaterials - synthesis techniques of nanomaterials such as top down synthesis of nanomaterials and Bottom up synthesis of nanomaterials- Characterization techniques and morphology of nanomaterials- Applications of nanomaterials in modern industries- Applications of nanomaterials in renewable energies.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to nanomaterials and classification of nanomaterials	1	3
Structure and physical and properties of nano materials	2	6
Mechanical and thermal properties of nanomaterials	2	6
Synthesis techniques of nanomaterials (top down)	2	6
Synthesis techniques of nanomaterials (Bottom up)	2	6
Characterization techniques and morphology of nanomaterials	2	6
Applications of nanomaterials in modern industries	2	6
Applications of nanomaterials in modern industries	2	6

2. Course components (total contact and credit hours per semester):							
		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	45					45
	Actual	45					45
Credit	Planned	45					45
	Actual	45					45

3. Individual study/learning hours expected for students per week.	6

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	Understand how modern knowledge is composed and how it is applied, as well as the impact of modern research on knowledge stocks in nanomaterials and related professional practices on their advanced applications .	• *Lectures, practical and independent study assignments.* • *Presentations on different topics.*	• *Classwork and Homework assignments.* • *Exam*
2.0	**Cognitive Skills**		
2.1	Apply continuously theoretical and practical knowledge in dealing with manufacturing of nanomaterials, new and unexpected obtained structures, and provide authentic and innovative responses to problems and issues related to fiber reinforced composite. Make convincing and informed judgments in situations where complete or consistent information is not available according to thier type of applications.	• *Realistic Case Studies*	• *Case Studies Presentations*
3.0	**Interpersonal Skills & Responsibility**		
3.2	Ability for the students to take full responsibilities for their work, and cooperate fully and	• *Team work practical study assignments*	• *Team work reports / presentations*

	constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicates effectively and at an appropriate level with academic recipients and the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report	• *Realistic Case Studies*	• *Case Studies reports / presentations*
5.0	**Psychomotor(if any)**		
5.1	Not Applicable		

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Homework assignments	All term long	10%
2	Presentations assignments	All term long	30%
3	Case studies Presentations/Reports	12-13-14	30%
4	Exam	16	30%

D. Student Academic Counseling and Support

1. **Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)** The supervisor of student research project will guide the student in selecting the courses to study to serve in the field of the graduation project he is submitting.

E Learning Resources

1. List Required Textbooks 1. A.S.Edelstein and R.C.Cammarata Ed. *Nanomaterials: Synthesis, Properties and Applications,*Institute of Physics Publishing, Bristol and Philadelphia 1996 2. Guozhong Cao, *Nanostructures & nanomaterials*, Imperial College Press, London, 2004 3. Gregory Timp Ed., *Nanotechnology*, AIP Press, Springer 1998 4. J.H.Fendler Ed., *Nanoparticles and Nanostructured Films*, Wiley-VCH 1998 5. C.P. Poole, Jr. and F.J. Owens, Introduction of Nanotechnology, Wiley 2003
2. List Essential References Materials (Journals, Reports, etc.)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Classroom
2. Technology resources (AV, data show, Smart Board, software, etc.) Data show
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
3. Procedures for Teaching Development

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *By the end of each semester, improvement actions according to course report by the faculty and the students results and surveys will be conducted if required*.

Name of Course Instructor: Prof Mohamed Korrany

Signature: _____ Date Completed: 10-11-2018

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018-11-8

COURSE SPECIFICATIONS

Form

Course Title: **Fundamentals of Nuclear Energy**

Course Code: **804620-3**

Date: 02-11-.2018.	**Institution**: Umm Al Qura University
College: College of Engineering and Islamic Architecture, Umm Al-Qura University - Makkah, KSA **Department**: Mechanical Dept.	

A. Course Identification and General Information

1. Course title and code: **Fundamentals of Nuclear Energy– 804620-3**
2. Credit hours: **3**
3. Program(s) in which the course is offered.

   MSc in Mechanical Engineering
4. Name of faculty member responsible for the course

   Prof. Dr. Adel Mohamed Abdelkader Abdeen
5. Level/year at which this course is offered:

   Master Level/Second Semester after Joining program.
6. Pre-requisites for this course (if any):

   BSc in Mechanical engineering
7. Co-requisites for this course (if any):

   Basic UG-level Heat Transfer & Fluid Mechanics.
8. Location if not on main campus: : **College of Engineering and Islamic Architecture, Umm Al-Qura University - Makkah, KSA**
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	■	percentage?	80%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	20%

Comments:

Other is a self-study part and report preparation in selected topics.

B Objectives

1. The main objective of this course

By the end of the course the students will have the following knowledge:-

- *General and detailed knowledge of Nuclear Energy*
- *Concept and theory of the nuclear reactions*
- *Basics of the radioactivity and nuclear pollution*
- *Types of nuclear reactors*
- *Fundamental of nuclear power generation*
- *information about Reactor Safety and Security*
- *Nuclear waste and management*

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

- *Through the readings, follow-up and presentation of the students to follow the updated topics in the field area using online materials.*

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

The aim of this course is to give basic and advanced knowledge in modern reactor physics. The main part of the course is devoted to neutron diffusion theory, theory of nuclear fission and their industrial applications (power generation). Present course introduces the students to the fundaments of nuclear power generation. Starting from the atomic structure, students will be gradually familiarized with different concepts, finally leading to the design of different reactors. Important topics such as nuclear waste management, biological impact of radiation and safety issues pertinent to handling nuclear fuels will also be discussed. Being a core discipline in nuclear engineering, the course focuses on fundamental concepts in reactor physics as well as basic physical processes that determine operation of nuclear reactors and some other related subjects.

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1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Fundamentals of Nuclear Power	1	3
Radioactivity & Nuclear reactions	2	6
Nuclear Fission	1	3
Chain Reaction in Reactors	1	3
Reactor Thermalhydraulics	2	6
Reactor Control	1	3
Thermal Reactors	2	6
Breeder Reactors	1	3
Nuclear Fusion	1	3
Biological Effects of Radiation	1	3

Reactor Safety and Security	1	3
Waste Management and Economics	1	3
Total	15	45

2. Course components (total contact and credit hours per semester):							
		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30	15				45
	Actual	30	15				45
Credit	Planned	30	15				45
	Actual	30	15				45

3. Individual study/learning hours expected for students per week.	3

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Figure out a comprehensive knowledge and critical understanding of the main subjects of the subject matter or specialization, including the main concepts, principles, theories and their current applications in the field of academic research specializing in mechanical engineering.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
1.2	Understand deeply one or more areas of specific specialization in relation to the latest theories, research and professional practice in mechanical engineering.		
2.0	**Cognitive Skills**		
2.1	Apply continuously theoretical and practical knowledge in dealing with a variety of contexts, new and unexpected scientific, and provide authentic and innovative responses to problems and issues. Make convincing and informed judgments in situations where complete or consistent information is not available.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
2.3	Plan and execute large projects or part of scientific research independently, applying his		

	theoretical and practical knowledge and using research methods to arrive at valuable conclusions that lead to important additions to current knowledge or professional practices.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Initiate the identification and creative handling of complex issues and problems in academic contexts. Act independently, when additional information or skills are needed, by searching for and applying the required information and skills.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
3.2	Take fully responsibilities for his work, and cooperate fully and constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations.		
3.3	Deals permanently and sensitively with complex ethical issues in academic or professional positions. Issue sound, fair and informed judgments based on well-known principles and values in cases that have not been thoroughly addressed in ethical standards, codes of practice or regulations. Issues fair and sound judgments based on informed knowledge and based on established principles and values. Points out the shortcomings in existing standards and practice to try to revise and reform them.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicates effectively and at an appropriate level with academic recipients and the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Quiz and Exercise	All along	10%
2	Report & Presentation	3-5	10%
3	Assignments	3, 7 and 11	10%
4	Mid-term	7	20%

5	Term Project	14	10%
6	Final exam	16	40%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

- ***Weekly office hours***
- ***Meetings and discussions on Blackboard***

E Learning Resources

1. List Required Textbooks

- *Raymond L. Murray, Nuclear Energy: An Introduction to the Concepts, Systems, and Applications of Nuclear Processes, 6th edition, Elsevier, Burlington, 2009.*
- *E. E. Lewis, Fundamentals of Nuclear Reactor Physics, Academic Press, Burlington, MA, 2008*

2. List Essential References Materials (Journals, Reports, etc.)

International ***Journal*** *of* ***Nuclear Energy*** *Science and Technology,* ***Journal*** *of* ***Nuclear Energy***

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

https://www.amazon.com/ & www.sciencedirect.com & www.springer.com

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

According the class requirements

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

Class room (with Data show & white board)

2. Technology resources (AV, data show, Smart Board, software, etc.)

Data show

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

nothing

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

Questionnaire & Oral Discussion

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department

laboratories to attain updated equipment.
Revising literature for new information.

3. Procedures for Teaching Development

laboratories to attain updated equipment. Revising literature for new information.

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) *Analysis of questionnaires and exam results at Department Councils.*
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *Improvement process according to course report may be performed*.

Name of Course Instructor:
Prof. Dr. Adel Mohamed Abdelkader Abdeen

_____

Signature: _ Adel Mohamed _ Date Completed: 02.11.2018

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018/11/17

COURSE SPECIFICATIONS

Form

Course Title: **Solar Thermal Energy Applications**

Course Code: **804621-3**

Date: 18-10-.2018.	**Institution**: Umm Al Qura University
College: College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA **Department**: Mechanical Dept.	

A. Course Identification and General Information

1. Course title and code**: Solar Thermal Energy Applications– 804621-3**

2. Credit hours: **3**

3. Program(s) in which the course is offered.

MSc in Mechanical Engineering

4. Name of faculty member responsible for the course

Assoc. Prof. Mohamed Hassan Ahmed Mohamed

5. Level/year at which this course is offered:

Master Level/Second Semester after Joining program.

6. Pre-requisites for this course (if any):

BSc in Mechanical engineering

7. Co-requisites for this course (if any):

Finishing the major courses of the program

8. Location if not on main campus: : **College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA**

9. Mode of Instruction (mark all that apply):

a. Traditional classroom	■	percentage?	80%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	20%

Comments:

Other is a self-study part and report preparation in selected topics.

B Objectives

1. The main objective of this course

The objective of this course is to provide general information regarding methods and technologies of solar energy usage in different processes.
1- Fundamental of solar energy processes
2- Review on heat transfer with emphasize on radiation
3- Solar energy for heating processes;
4- Plate and concentrating collectors (fixed and tracking systems); heat exchangers and thermal storage; cooling systems; water desalination systems; solar thermo-chemical processes to produce hydrogen and solar power generation
5- Introduction to low temperature applications such as solar hot water, space heating and water distillation
6- System design and performance; predicted energy savings and related economics

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

Update information about Solar energy will be explored throughout Elsevier and Springer Scientific Related Journals.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

This course will provide general information regarding methods and technologies of solar energy usage in different processes. For this purpose, Fundamental of solar energy processes and review on heat transfer with emphasize on radiation solar energy for heating processes should be detailed. In this course will be presented plate and concentrating collectors (fixed and tracking systems); heat exchangers and thermal storage; cooling systems; water desalination systems; solar thermochemical processes to produce hydrogen and solar power generation - Introduction to low temperature applications such as solar hot water, space heating and water distillation – System design and performance; predicted energy savings and related economics.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Fundamental of solar energy processes	2	6
Review on heat transfer with emphasize on radiation	2	6
solar energy for heating processes;	3	9
plate and concentrating collectors (fixed and tracking systems); heat exchangers and thermal storage; cooling systems; water desalination systems; solar thermo-chemical processes to produce hydrogen and solar power generation	3	9
Introduction to low temperature applications such as solar hot water, space heating and water distillation	2	6

System design and performance; predicted energy savings and related economics	3	9
Total	15	45

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30	9	3	3		45
	Actual	30	9	3	3		45
Credit	Planned	30	9	3	3		45
	Actual	30	9	3	3		45

3. Individual study/learning hours expected for students per week. **2**

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Figure out a comprehensive knowledge and critical understanding of the main subjects of the subject matter or specialization, including the main concepts, principles, theories and their current applications in the field of academic research specializing in mechanical engineering.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
1.2	Understand deeply one or more areas of specific specialization in relation to the latest theories, research and professional practice in mechanical engineering.		
1.4	Realize the recent regulations and procedures in the local and international environment that may affect the specialty of mechanical engineering, as well as the reasons for these changes and their future implications		
2.0	**Cognitive Skills**		

2.1	Apply continuously theoretical and practical knowledge in dealing with a variety of contexts, new and unexpected scientific, and provide authentic and innovative responses to problems and issues. Make convincing and informed judgments in situations where complete or consistent information is not available.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
2.2	Extracts from published research or professional reports and can apply them, develops important new ideas and integrates them into their knowledge or experiences. Applies specialized and general research methods in the creative analysis of complex issues and in the development of results and proposals related to its academic field.		
2.3	Plan and execute large projects or part of scientific research independently, applying his theoretical and practical knowledge and using research methods to arrive at valuable conclusions that lead to important additions to current knowledge or professional practices.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Initiate the identification and creative handling of complex issues and problems in academic contexts. Act independently, when additional information or skills are needed, by searching for and applying the required information and skills.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
3.2	Take fully responsibilities for his work, and cooperate fully and constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicates effectively and at an appropriate level with academic recipients and the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
4.2	Obtain and performs statistical and mathematical data in a critical and efficient manner. Use a wide		

	range of appropriate information and communication technologies to examine issues and communicate findings and recommendations.		

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Quiz and Exercise		10%
2	Report & Presentation	3-5	10%
3	Mid-term	7	20%
4	Final exam	16	60%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

- ***Weekly office hours***
- ***Meetings and discussions on Blackboard***

E Learning Resources

1. List Required Textbooks

- *Garg & Prakash, H. P. Garg, Solar Energy: Fundamentals and Applications, McGraw-Hill Education, 2000*
- *Yüncü, Hafit, Paykoc, E., Yener, Y Solar Energy Utilization Fundamentals and Applications, Springer*
- *iwari, G. N., Tiwari, Arvind, Shyam Handbook of Solar Energy Theory, Analysis and Applic Springer*

2. List Essential References Materials (Journals, Reports, etc.)

- *Solar Energy, ISSN: 0038-092X Elsevier*
- *Applied Solar Energy ISSN: 0003-701X (print version) ISSN: 1934-9424 (electronic version springer*

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

www.asme.org & www.sciencedirect.com & www.springer.com

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

According the class requirements

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

Class room (with Data show & white board)
Laboratory (Solar lab.)

2. Technology resources (AV, data show, Smart Board, software, etc.)

Data show

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

nothing

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *Upgrading the laboratories to attain updated equipment.* *Revising literature for new information. Analysis of questionnaires and exam results at Department Councils.*
3. Procedures for Teaching Development *Analysis of questionnaires and exam results at Department Councils.*
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) *Analysis of questionnaires and exam results at* independent member teaching staff.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *After each semester it will be taught, improvement process according to course report may be performed.*

Name of Course Instructor:
Assoc. Prof. Mohamed Hassan Ahmed Mohamed

_____

Signature: _ Mohamed Hassan _ Date Completed: __18/10/2018_

Program Coordinator: Prof Mohamed Korrany
Signature: _____ Date Received: 2018/11/17

COURSE SPECIFICATIONS

Form

Course Title: **Wind Energy Conversion**

Course Code: **804622-3**

Date: 18-10-.2018.	**Institution**: Umm Al Qura University
College: College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA **Department**: Mechanical Dept.	

A. Course Identification and General Information

1. Course title and code: ***Wind Energy Conversion*** – **804622-3**

2. Credit hours: **3**

3. Program(s) in which the course is offered.

   MSc in Mechanical Engineering

4. Name of faculty member responsible for the course

   Assoc. Prof. Mohamed Hassan Ahmed Mohamed

5. Level/year at which this course is offered:

   Master Level/Second Semester after Joining program.

6. Pre-requisites for this course (if any):

   BSc in Mechanical engineering

7. Co-requisites for this course (if any):

   Finishing the major courses of the program

8. Location if not on main campus: : **College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA**

9. Mode of Instruction (mark all that apply):

a. Traditional classroom	■	percentage?	80%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	20%

Comments:

Other is a self-study part and report preparation in selected topics.

B Objectives

1. The main objective of this course

The course aims to introduce concepts and techniques of energy production from wind:
1-Overview of wind engineering: benefits of wind energy; assessment of wind resources; assessment of means of energy production, consumption, and cost; green credit; and wind turbine terminology and definitions.
2. Conversion of mechanical energy into electricity: basic AC power generators.
3. Impact of wind turbines on the environment.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

Update information about wind energy will be explored throughout Elsevier and Springer Scientific Related Journals.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

The course aims to introduce concepts and techniques of energy production from wind energy. Wind machine types, classification, parameters - Wind and its structure, statistics, measurements, data presentation, and power in the wind - Wind turbine aerodynamics, momentum theories, basic aerodynamics, airfoils and their characteristics - Horizontal Axis Wind Turbine (HAWT); Blade Element Theory, wake analysis, Vertical Axis Wind Turbine (VAWT) aerodynamics - HAWT rotor design considerations; power regulation, yaw system, tower - Wind turbine loads, aerodynamic loads in steady operation, wind turbulence, static - dynamic - fatigue analysis, yawed operation and tower shadow, WECS control system, requirements and strategies. Wind Energy Conversion System (WECS) siting, rotor selection, Annual Energy Output (AEO).

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Overview of wind engineering: *benefits of wind energy; assessment of wind resources; assessment of means of energy production, consumption and wind turbine terminology and definitions*	2	6
Blade element theory: *inflow models based on combined blade element theory; incorporation of swirl losses in inflow; root and tip losses and stall delay models; and assessment of publicly available wind turbine modeling tools*	2	6

Horizontal Axis Wind Turbine (HAWT) design: Using blade element theory, wake analysis, HAWT rotor design considerations; power regulation, yaw system	3	9
Vertical Axis Wind Turbine (VAWT) design : Using blade element theory	2	6
Wind turbine loads: aerodynamic loads in steady operation, wind turbulence, static- dynamic - fatigue analysis, yawed operation and tower shadow	3	9
Conversion of mechanical energy into electricity: basic AC power generators; hybrid power systems; and hybrid system modeling and simulation	3	9
Total	15	45

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30	9	3	3		45
	Actual	30	9	3	3		45
Credit	Planned	30	9	3	3		45
	Actual	30	9	3	3		45

3. Individual study/learning hours expected for students per week. **2**

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Figure out a comprehensive knowledge and critical understanding of the main subjects of the subject matter or specialization, including the main concepts, principles, theories and their current applications in the field of academic research specializing in mechanical engineering.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.* •	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
1.2	Understand deeply one or more areas of specific specialization in relation to the latest theories,		

	research and professional practice in mechanical engineering.		
2.0	**Cognitive Skills**		
2.1	Apply continuously theoretical and practical knowledge in dealing with a variety of contexts, new and unexpected scientific, and provide authentic and innovative responses to problems and issues. Make convincing and informed judgments in situations where complete or consistent information is not available.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
2.2	Extracts from published research or professional reports and can apply them, develops important new ideas and integrates them into their knowledge or experiences. Applies specialized and general research methods in the creative analysis of complex issues and in the development of results and proposals related to its academic field.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Initiate the identification and creative handling of complex issues and problems in academic contexts. Act independently, when additional information or skills are needed, by searching for and applying the required information and skills.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
3.2	Take fully responsibilities for his work, and cooperate fully and constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations.		
3.3	Deals permanently and sensitively with complex ethical issues in academic or professional positions. Issue sound, fair and informed judgments based on well-known principles and values in cases that have not been thoroughly addressed in ethical standards, codes of practice or regulations. Issues fair and sound judgments based on informed knowledge and based on established principles and values. Points out the shortcomings in existing standards and practice to try to revise and reform them.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicates effectively and at an appropriate level with academic recipients and	• *Lectures, tutorials, practical and*	• *Classwork and Homework*

	the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report.	*independent study assignments.* • *Power point and video presentation on different topics.*	*assignments.* • *Midterm.* • *Quizzes* • *Final exam*
4.2	Obtain and performs statistical and mathematical data in a critical and efficient manner. Use a wide range of appropriate information and communication technologies to examine issues and communicate findings and recommendations.		

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Quiz and Exercise		10%
2	Report & Presentation	3-5	10%
3	Mid-term	7	20%
4	Final exam	16	60%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

• ***Weekly office hours***

• ***Meetings and discussions on Blackboard***

E Learning Resources

1. List Required Textbooks

• *James Manwell, Jon McGowan, Anthony Rogers, "Wind Energy Explained: Theory, Design and Application, 2nd Edition",John Wiley & Sons, 2010, ISBN: 978-0-470- 01500-1.*

• *Burton, Sharpe, Jenkins and Bossanyi, Wind Energy Handbook; Wiley, 2001, ISBN 0 471 48997 2*

• *Freris & Infield, Renewable Energy in Power Systems; Wiley, 2008, ISBN 978 0 471 01749 4*

• *L Freris; Wind Energy Conversion Systems, Prentice Hall, 1900, ISBN 013 960527 4*

• *Dr. John Wagner, Fundamentals of Wind Power, Lecture Notes and Homework Problems, V8.0, May 2017.*

• *M. Hansen, Aerodynamics of Wind Turbines, Routledge, 2007.*

2. List Essential References Materials (Journals, Reports, etc.)

- *Wind energy, Online ISSN: 1099-1824,*
- *Renewable Energy, ISSN: 0960-1481*

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

www.asme.org & www.sciencedirect.com & www.springer.com

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

According the class requirements

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

Class room (with Data show & white board)

Laboratory (wind energy and turbomachines lab.)

2. Technology resources (AV, data show, Smart Board, software, etc.) *Data show & CFD software*.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) *nothing*

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *Upgrading the laboratories to attain updated equipment.* *Revising literature for new information*.
3. Procedures for Teaching Development *Analysis of questionnaires and exam results at Department Councils.*
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) *Analysis of questionnaires and exam results at Department Councils.*
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *After each semester it will be taught, improvement process according to course report may be performed*.

Name of Course Instructor:
Assoc. Prof. Mohamed Hassan Ahmed Mohamed

_____

Signature: _ Mohamed Hassan _ Date Completed: __18/10/2018_

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018/11/17

COURSE SPECIFICATIONS

Form

Course Title: **Photovoltaic Technology**

Course Code: **804623-3**

Date: 18-10-.2018.	**Institution**: Umm Al Qura University
College: College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA **Department**: Mechanical Dept.	

A. Course Identification and General Information

1. Course title and code: **Photovoltaic Technology– 804623-3**
2. Credit hours: **3**
3. Program(s) in which the course is offered.

   MSc in Mechanical Engineering
4. Name of faculty member responsible for the course

   Assoc. Prof. Mohamed Hassan Ahmed Mohamed
5. Level/year at which this course is offered:

   Master Level/Second Semester after Joining program.
6. Pre-requisites for this course (if any):

   BSc in Mechanical engineering
7. Co-requisites for this course (if any):

   Finishing the major courses of the program
8. Location if not on main campus: : **College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA**
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	■	percentage?	80%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	20%

Comments:

Other is a self-study part and report preparation in selected topics.

B Objectives

1. The main objective of this course

• *To gain an understanding of the state of the art and current primary research focuses in all common and emerging photovoltaic technologies.*
• *To learn how solar cell operation is modeled to diagnose and optimize devices.*
• *To gain an overview of methods to produce solar cells and some of the problems and solutions in manufacturing the devices.*
• *To understand how photovoltaics fit in to future energy generation schemes.*
• *To know the different algorithms to extract maximum power from the PV system*
• *To learn the general aspects of how solar cell materials and devices are characterized.*

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

Update information about Solar energy will be explored throughout Elsevier and Springer Scientific Related Journals.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

This course aims to introduce concepts of the photovoltaic (PV) systems - Solar energy potential for PV - irradiance, solar radiation and spectrum of sun - Photovoltaic effect, conversion of solar energy into electrical energy - behavior of solar cells - Solar cells, basic structure and characteristics: Single crystalline, multi-crystalline - thin film silicon solar cells – Electrical characteristics of the solar cell-equivalent circuit, modeling of solar cells including the effects of temperature-- solar cell arrays, PV modules, PV generators, shadow effects and bypass diodes, Interfacing PV modules to loads, direct connection of loads to PV modules - connection of PV modules to a battery and load together - Energy storage alternatives for PV systems - types of Storage batteries, properties and modeling of batteries - Power conditioning and maximum power point tracking (MPPT) algorithms based on buck- and boost-converter topologies - Maximum power point tracking (MPPT) algorithms - Inverter control topologies for stand-alone and grid-connected operation - Analysis of the inverter - Feasible operating region of inverter at different power factor values for grid-connected systems - Stand-alone PV systems. Consumer applications, residential systems - PV water pumping- PV powered lighting, Grid-connected (utility interactive) PV systems - Modeling and simulation of stand-alone and grid-connected PV systems.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours

PV - irradiance, solar radiation and spectrum of sun - Photovoltaic effect, conversion of solar energy into electrical energy - behavior of solar cells - Solar cells, basic structure and characteristics: Single crystalline, multi-crystalline - thin film silicon solar cells - Electrical characteristics of the solar cell.	3	9
Equivalent circuit, modeling of solar cells including the effects of temperature—solar cell arrays, PV modules, PV generators, shadow effects and bypass diodes, Interfacing PV modules to loads, direct connection of loads to PV modules	3	9
connection of PV modules to a battery and load together - Energy storage alternativesvfor PV systems - types of Storage batteries, properties and modeling of batteries - Power conditioning and maximum power point tracking (MPPT) algorithms based on buck- and boost-converter topologies	3	9
Maximum power point tracking (MPPT) algorithms - Inverter control topologies for stand-alone and grid-connected operation - Analysis of the inverter – Feasible operating region of inverter at different power factor values for grid-connected systems - Stand-alone PV systems.)	3	9
Consumer applications, residential systems - PV water pumping- PV powered lighting, Grid-connected (utility interactive) PV systems - Modeling and simulation of standalone and grid-connected PV systems.	3	9
Total	15	45

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30	9	3	3		45
	Actual	30	9	3	3		45
Credit	Planned	30	9	3	3		45
	Actual	30	9	3	3		45

3. Individual study/learning hours expected for students per week. **2**

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map			
Code #	**NQF Learning Domains And Course Learning Outcomes**	**Course Teaching Strategies**	**Course Assessment Methods**
1.0	**Knowledge**		
1.1	Figure out a comprehensive knowledge and critical understanding of the main subjects of the subject matter or specialization, including the main concepts, principles, theories and their current applications in the field of academic research specializing in mechanical engineering.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
1.2	Understand deeply one or more areas of specific specialization in relation to the latest theories, research and professional practice in mechanical engineering.		
1.4	Realize the recent regulations and procedures in the local and international environment that may affect the specialty of mechanical engineering, as well as the reasons for these changes and their future implications		
2.0	**Cognitive Skills**		
2.1	Apply continuously theoretical and practical knowledge in dealing with a variety of contexts, new and unexpected scientific, and provide authentic and innovative responses to problems and issues. Make convincing and informed judgments in situations where complete or consistent information is not available.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
2.2	Extracts from published research or professional reports and can apply them, develops important new ideas and integrates them into their knowledge or experiences. Applies specialized and general research methods in the creative analysis of complex issues and in the development of results and proposals related to its academic field.		
2.3	Plan and execute large projects or part of scientific research independently, applying his theoretical and practical knowledge and using research methods to arrive at valuable conclusions that lead to important additions to current knowledge or professional practices.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Initiate the identification and creative handling	• *Lectures, tutorials,*	• *Classwork and*

	of complex issues and problems in academic contexts. Act independently, when additional information or skills are needed, by searching for and applying the required information and skills.	*practical and independent study assignments.* • *Power point and video presentation on different topics.*	*Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
3.2	Take fully responsibilities for his work, and cooperate fully and constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations.		
3.3	Deals permanently and sensitively with complex ethical issues in academic or professional positions. Issue sound, fair and informed judgments based on well-known principles and values in cases that have not been thoroughly addressed in ethical standards, codes of practice or regulations. Issues fair and sound judgments based on informed knowledge and based on established principles and values. Points out the shortcomings in existing standards and practice to try to revise and reform them.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicates effectively and at an appropriate level with academic recipients and the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
4.2	Obtain and performs statistical and mathematical data in a critical and efficient manner. Use a wide range of appropriate information and communication technologies to examine issues and communicate findings and recommendations.		

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Quiz and Exercise		10%
2	Report & Presentation	3-5	10%
3	Mid-term	7	20%
4	Final exam	16	60%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week) • ***Weekly office hours*** • ***Meetings and discussions on Blackboard***

E Learning Resources

1. List Required Textbooks • *Abtahi, Amir; Messenger, Roger "Photovoltaic Systems Engineering"4th edition CRC Press- 2017* • *Ali Sayigh "Photovoltaics for Sustainable Electricity and Buildings", Springer International Publishing – 2017.• iwari, G. N., Tiwari, Arvind, Shyam Handbook of Solar Energy Theory, Analysis and Applic Springer*
2. List Essential References Materials (Journals, Reports, etc.) • *Solar Energy, ISSN: 0038-092X Elsevier* • *Applied Solar Energy ISSN: 0003-701X (print version) ISSN: 1934-9424 (electronic version springer*
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. *www.asme.org & www.sciencedirect.com & www.springer.com*
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. According the class requirements

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) *Class room (with Data show & white board)* *Laboratory (Solar lab.)*
2. Technology resources (AV, data show, Smart Board, software, etc.) *Data show*
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) *nothing*

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *Upgrading the laboratories to attain updated equipment.* *Revising literature for new information.*
3. Procedures for Teaching Development *Analysis of questionnaires and exam results at Department Councils.*
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) *Analysis of questionnaires and exam results at Department Councils.*
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *After each semester it will be taught, improvement process according to course report may be*

performed.

Name of Course Instructor:
Assoc. Prof. Mohamed Hassan Ahmed Mohamed

_____

Signature: _ Mohamed Hassan _ Date Completed: __18/10/2018_

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018/11/17

COURSE SPECIFICATIONS

Form

Course Title: **Introduction to Renewable Energy**

Course Code: **804624-3**

Date: 18-10-.2018.	**Institution**: Umm Al Qura University
College: College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA **Department**: Mechanical Dept.	

A. Course Identification and General Information

1. Course title and code: **Introduction to Renewable Energy – 804624-3**

2. Credit hours: **3**

3. Program(s) in which the course is offered.

MSc in Mechanical Engineering

4. Name of faculty member responsible for the course

Assoc. Prof. Mohamed Hassan Ahmed Mohamed

5. Level/year at which this course is offered:

Master Level/Second Semester after Joining program.

6. Pre-requisites for this course (if any):

BSc in Mechanical engineering

7. Co-requisites for this course (if any):

Finishing the major courses of the program

8. Location if not on main campus: : **College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA**

9. Mode of Instruction (mark all that apply):

a. Traditional classroom	■	percentage?	80%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	20%

Comments:

Other is a self-study part and report preparation in selected topics.

B Objectives

1. The main objective of this course

• *To give sufficient knowledge about the promising new and renewable sources of energy*
• *To equip students in working with projects and to take up research work in connected areas.*

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

- *Update information about renewable energy will be explored throughout Elsevier and Springer Scientific Related Journals.*
- *Better utilization of renewable energy laboratory so that students can experience the practical application of the theory of RE*
- *Use of data show presentation and video section (Very important)*

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

***Introduction**: Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources*
***Solar thermal systems**: Introduction, Solar Constant, Basic Sun-Earth Angles, Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer .Principle of Conversion of Solar Radiation into Heat, – Solar thermal collectors – General description and characteristics – Flat plate collectors – Heat transfer processes – Solar concentrators (parabolic trough, parabolic dish, Central Tower Collector) – performance evaluation.*
***Solar thermal systems**: Introduction, Solar Constant, Basic Sun-Earth Angles, Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer .Principle of Conversion of Solar Radiation into Heat, – Solar thermal collectors – General description and characteristics – Flat plate collectors – Heat transfer processes – Solar concentrators (parabolic trough, parabolic dish, Central Tower Collector) – performance evaluation.*
***Solar electric systems**: Solar Thermal Electric Power Generation –; Solar Photovoltaic – Solar Cell fundamentals, characteristics, classification, construction of module, panel and array. Solar PV Systems – stand-alone and grid connected; Applications –Street lighting, Domestic lighting and Solar Water pumping systems.*
***Energy from ocean**: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Advantages and Limitations of TPP. Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitations*

of OTEC.
***Wind energy**: Introduction, Wind and its Properties, History of Wind Energy, Wind Energy Scenario. Basic principles of Wind Energy Conversion Systems (WECS), Classification of WECS, Parts of WECS, Derivation for Power in the wind, Electrical Power Output and Capacity Factor of WECS, Advantages and Disadvantages of WECS*
***Biomass energy**: Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation, types of biogas plants. Small hydro power: Classification as micro, mini and small hydro projects - Basic concepts.*
***Geothermal Energy:** Geothermal resources. Geothermal heating and air conditioning applications. Low- temperature geothermal applications for heat generation. High temperature geothermal power production: Natural or flashbased geothermal installations. Design and calculation of geothermal processes.*
***Emerging technologies:** Fuel Cell, Small Hydro Resources, Hydrogen Energy, alcohol energy, nuclear fusion and power from satellite stations.*

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
***Introduction**: Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources*	1	3
***Solar thermal systems**: Introduction, Solar Constant, Basic Sun-Earth Angles, Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer .Principle of Conversion of Solar Radiation into Heat, – Solar thermal collectors – General description and characteristics – Flat plate collectors – Heat transfer processes – Solar concentrators (parabolic trough, parabolic dish, Central Tower Collector) –performance evaluation.*	3	9
***Solar electric systems**: Solar Thermal Electric Power Generation –; Solar Photovoltaic – Solar Cell fundamentals, characteristics, classification, construction of module, panel and array. Solar PV Systems – stand-alone and grid connected; Applications –Street lighting, Domestic lighting and Solar Water pumping systems..*	2	6
***Energy from ocean**: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Advantages and Limitations of TPP. Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitations of OTEC.*	2	6

***Wind energy**: Introduction, Wind and its Properties, History of Wind Energy, Wind Energy Scenario. Basic principles of Wind Energy Conversion Systems (WECS), Classification of WECS, Parts of WECS, Derivation for Power in the wind, Electrical Power Output and Capacity Factor of WECS, Advantages and Disadvantages of WECS and types of turbines – Design and selection considerations.*	2	6
***Biomass energy**: Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation, types of biogas plants. Small hydro power: Classification as micro, mini and small hydro projects - Basic concepts.*	2	6
***Geothermal Energy:** Geothermal resources. Geothermal heating and air conditioning applications. Low- temperature geothermal applications for heat generation. High temperature geothermal power production: Natural or flashbased geothermal installations. Design and calculation of geothermal processes,*	2	6
***Emerging technologies:** Fuel Cell, Small Hydro Resources, Hydrogen Energy, alcohol energy, nuclear fusion and power from satellite stations.*	1	3
Total	15	45

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30	9	3	3		45
	Actual	30	9	3	3		45
Credit	Planned	30	9	3	3		45
	Actual	30	9	3	3		45

3. Individual study/learning hours expected for students per week. **2**

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Figure out a comprehensive knowledge and critical understanding of the main subjects of the subject matter or specialization, including the main concepts, principles, theories and their current applications in the field of academic research specializing in mechanical engineering.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.* •	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
1.2	Understand deeply one or more areas of specific specialization in relation to the latest theories, research and professional practice in mechanical engineering.		
2.0	**Cognitive Skills**		
2.1	Apply continuously theoretical and practical knowledge in dealing with a variety of contexts, new and unexpected scientific, and provide authentic and innovative responses to problems and issues. Make convincing and informed judgments in situations where complete or consistent information is not available.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
2.3	Plan and execute large projects or part of scientific research independently, applying his theoretical and practical knowledge and using research methods to arrive at valuable conclusions that lead to important additions to current knowledge or professional practices.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Initiate the identification and creative handling of complex issues and problems in academic contexts. Act independently, when additional information or skills are needed, by searching for and applying the required information and skills.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
3.2	Take fully responsibilities for his work, and cooperate fully and constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations.		
3.3	Deals permanently and sensitively with complex ethical issues in academic or professional positions. Issue sound, fair and informed judgments based on well-known principles and values in cases that have not		

	been thoroughly addressed in ethical standards, codes of practice or regulations. Issues fair and sound judgments based on informed knowledge and based on established principles and values. Points out the shortcomings in existing standards and practice to try to revise and reform them.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicates effectively and at an appropriate level with academic recipients and the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Quiz and Exercise	All along	10%
2	Report & Presentation	3-5	10%
3	Mid-term	7	20%
4	Final exam	16	60%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)
- ***Weekly office hours***
- ***Meetings and discussions on Blackboard***

E Learning Resources

1. List Required Textbooks
- *Abbasi S. A. and N. Abbasi, Renewable Energy Sources and Their Environmental Impact, Prentice Hall of India, 2001*
- *G.N. Tiwari: Solar Energy-Fundamentals, Design, Modelling and Applications, Narosa Publishers, 2002*
- *Khan B. H., Non-Conventional Energy Resources, Tata McGraw Hill, 2009*

2. List Essential References Materials (Journals, Reports, etc.)
Solar energy – Wind energy- Biomass - Applied Thermal Engineering

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
www.asme.org & www.sciencedirect.com & www.springer.com

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.
According the class requirements

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

Class room (with Data show & white board) *Laboratory (Renewable energy lab.)*
2. Technology resources (AV, data show, Smart Board, software, etc.) *Data show*
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) *nothing*

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *Upgrading the laboratories to attain updated equipment.* *Revising literature for new information*.
3. Procedures for Teaching Development • *Plan: The instructor will develop a strategy for teaching.* • *Do: The strategy will be implemented for one semester.* • *Study: The experiences of the students will be collected through a survey.* • *Act: Effective teaching strategies will be implemented and revised as more experiences are gained.*
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) *Analysis of questionnaires and exam results at Department Councils.*
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *After each semester it will be taught, improvement process according to course report may be performed*.

Name of Course Instructor:
Assoc. Prof. Mohamed Hassan Ahmed Mohamed

_____

Signature: _ Mohamed Hassan _ Date Completed: __18/10/2018_

Program Coordinator: Prof Mohamed Korrany
Signature: _____ Date Received: __17/11/2018

COURSE SPECIFICATIONS

Form

Course Title: ***Fuel Cells***

Course Code: **804625-3**

Date: 18-10-.2018.	**Institution**: Umm Al Qura University
College: College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA **Department**: Mechanical Dept.	

A. Course Identification and General Information

1. Course title and code: **Fuel Cells – 804625-3**
2. Credit hours: **3**
3. Program(s) in which the course is offered.

   MSc in Mechanical Engineering
4. Name of faculty member responsible for the course

   Assoc. Prof. Mohamed Hassan Ahmed Mohamed
5. Level/year at which this course is offered:

   Master Level/Second Semester after Joining program.
6. Pre-requisites for this course (if any):

   BSc in Mechanical engineering
7. Co-requisites for this course (if any):

   Finishing the major courses of the program
8. Location if not on main campus: : **College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA**
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	■	percentage?	80%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	20%

Comments:

Other is a self-study part and report preparation in selected topics.

B Objectives

1. The main objective of this course

The students will be able to:-
1. Demonstrate knowledge of thermodynamics for reacting systems including electron motion
2. Demonstrate knowledge on different methods to store the produced hydrogen
3. Adopt awareness of materials recommended for hydrogen storage.
4. Understand concepts for realizing fuel cell for different applications
5. Employ available resources efficiently

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

Update information about use of technologies of fuel cells and hydrogen usage and storage in different applications will be explored throughout Elsevier and Springer Scientific Related Journals.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Course aims to cover principles of electrochemical engineering, hydrogen production and storage, and the design and application of the main types of fuel cells.
Introduction to the principle and operation of various types of fuel cells (such as alkaline, proton exchange membrane, phosphoric acid, molten carbonate, solid oxide, and direct methanol fuel cells) - Overview of fuel cell technology – Thermochemistry of fuel cells – Production of hydrogen from fossil fuels, biomass, nuclear reactor, and electrolysis of water – Hydrogen fuel cell technology – Hydrogen storage materials – Catalysis in fuel cells and hydrogen production - Use of hydrogen as a fuel in transportation - Nanomaterials applications and environmental issues in electrochemical energy conversion and storage – Introduction to simulation and modelling of fuel cell system.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to the principle and operation of various types of fuel cells (such as alkaline, proton exchange membrane, phosphoric acid, molten carbonate, solid oxide, and direct methanol fuel cells	3	9
Overview of fuel cell technology	1	3
Thermochemistry of fuel cells	1	3
Production of hydrogen from fossil fuels, biomass, nuclear reactor, and electrolysis of water	2	6
Hydrogen fuel cell technology	1	3
Hydrogen storage materials	1	3

Catalysis in fuel cells and hydrogen production	2	6
Use of hydrogen as a fuel in transportation.	1	3
Nanomaterials applications and environmental issues in electrochemical energy conversion and storage	2	6
Introduction to simulation and modelling of fuel cell system	1	3
Total	15	45

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30	18	6	6		60
	Actual	30	18	6	6		60
Credit	Planned	30	9	3	3		45
	Actual	30	9	3	3		45

3. Individual study/learning hours expected for students per week. **2**

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Figure out a comprehensive knowledge and critical understanding of the main subjects of the subject matter or specialization, including the main concepts, principles, theories and their current applications in the field of academic research specializing in mechanical engineering.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.* •	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
1.2	Understand deeply one or more areas of specific specialization in relation to the latest theories, research and professional practice in mechanical engineering.		
2.0	**Cognitive Skills**		
2.1	Apply continuously theoretical and practical knowledge in dealing with a variety of contexts, new and unexpected scientific, and provide authentic and innovative responses to problems and issues. Make convincing and informed judgments in situations where complete or consistent information is not	• *Lectures, tutorials, practical and independent study assignments.*	•*Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*

	available.	• *Power point and video presentation on different topics.*	
2.2	Extracts from published research or professional reports and can apply them, develops important new ideas and integrates them into their knowledge or experiences. Applies specialized and general research methods in the creative analysis of complex issues and in the development of results and proposals related to its academic field.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Initiate the identification and creative handling of complex issues and problems in academic contexts. Act independently, when additional information or skills are needed, by searching for and applying the required information and skills.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
3.2	Take fully responsibilities for his work, and cooperate fully and constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations.		
3.3	Deals permanently and sensitively with complex ethical issues in academic or professional positions. Issue sound, fair and informed judgments based on well-known principles and values in cases that have not been thoroughly addressed in ethical standards, codes of practice or regulations. Issues fair and sound judgments based on informed knowledge and based on established principles and values. Points out the shortcomings in existing standards and practice to try to revise and reform them.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicates effectively and at an appropriate level with academic recipients and the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
4.2	Obtain and performs statistical and mathematical data in a critical and efficient manner. Use a wide range of appropriate information and communication technologies to examine issues and communicate findings and recommendations.		

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**

1	Quiz and Exercise		10%
2	Report & Presentation	3-5	10%
3	Mid-term	7	20%
4	Final exam	16	60%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

- ***Weekly office hours***
- ***Meetings and discussions on Blackboard***

E Learning Resources

1. List Required Textbooks

- *B. Sörensen, "Hydrogen and fuel cells: emerging technologies and applications" 2nd ed., Academic Press is an imprint of Elsevier, Amsterdam, 2012. (ISBN: 978-0-12-387709-3)*
- *M. F. Hordeski, "Hydrogen & fuel Cells: Advances in transportation and power", Fairmont Press, Inc., 2009. (ISBN 0-88173-561-2)*
- *R.B. Gupta (Editor), "Hydrogen fuel: production, transport and storage", CRC Press - Taylor & Francis Group, LLC, 2009. (ISBN 978-1-4200-4575-8)*
- *M. F. Hordeski, "Alternative fuels: the future of hydrogen", 3rd Ed., Fairmont Press, Inc., 2013. (ISBN: 0-88173-687-2)*
- *S.L. Suib (Editor), "New and future developments in catalysis: Batteries, hydrogen storage, and fuel cells", Elsevier, Amsterdam, 2013. (ISBN: 978-0-444-53880-2).*
- *A. Basile, A. Iulianelli (Editors), "Advances in hydrogen production, storage and distribution", Woodhead Publishing is an imprint of Elsevier, Cambridge, 2014. (ISBN: 978-0-85709-768-2 (print) & ISBN 978-0-85709-773-6 (online))*

2. List Essential References Materials (Journals, Reports, etc.)

Fuel cell, Hydrogen, Energy, Applied Energy, Fuel & Energy

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

www.asme.org & www.sciencedirect.com & www.springer.com

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

According the class requirements

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

Class room (with Data show & white board)
Laboratory (Thermodynamics, Thermal Engines, Fuel Measurements)

2. Technology resources (AV, data show, Smart Board, software, etc.)

Data show & CFD software.

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

Multi-fuel analyzer – Burners – Sample of industrial gas turbine – Thermocouples and pyrometers for flame measurements – Bomb Calorimeter – Ultrasonicator and rotor stator.

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

Questionnaire & Oral Discussion
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *Upgrading the laboratories to attain updated equipment.* *Revising literature for new information*.
3. Procedures for Teaching Development *Analysis of questionnaires and exam results at Department Councils.*
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) *Analysis of questionnaires and exam results at Department Councils.*
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *After each semester it will be taught, improvement process according to course report may be performed*.

Name of Course Instructor:
Assoc. Prof. Mohamed Hassan Ahmed Mohamed

_____

Signature: _ Mohamed Hassan _ Date Completed: __18/10/2018_

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018/11/17

COURSE SPECIFICATIONS

Form

Course Title: Water Desalination

Course Code: 804626-3

Date: 20.. 18…–…11…–..1.	**Institution**: Umm Al-Qura University
College: CEIA	**Department**: Mechanical Engineering

A. Course Identification and General Information

1. Course title and code: Water Desalination; 804626-3
2. Credit hours: 3
3. Program(s) in which the course is offered.

   (If general elective available in many programs indicate this rather than list programs)

   Mechanical Engineering Department
4. Name of faculty member responsible for the course

   Dr. Eng. Kamel Mohamed Guedri
5. Level/year at which this course is offered:
6. Pre-requisites for this course (if any):
7. Co-requisites for this course (if any): None
8. Location if not on main campus: None
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	■	percentage?	100%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

Upon successful completion of the course, the students will be able to:

1. Identify the world and regional areas of water shortage and be able to select the proper desalination method to solve a water shortage problem.
2. Classify the different technologies for saline water desalination.
3. Carry out the basic process calculations of the main desalination processes
4. Define the performance of different desalination processes and the factors affecting them
5. Define the different alternative energy sources to drive desalination processes
6. Define the different Promising Future Desalination Processes

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Introduces the fundamental science and technology of desalinating saline water to overcome water scarcity and ensure sustainable water supplies. The course covers: (1) Water scarcity and desalination, (2) Saline water properties, (3) Fundamentals of desalination, (4) Thermal desalination processes (Multi Stage Flash-MSF, Multi Effect Distillation-MED- and Vapor Compression (VC) , (5) Membrane desalination processes (Reverse Osmosis-RO-, Electro Dialysis-ED), (6) Introduction to alternative driving energies (solar and nuclear) and Future Technologies(H-DH, MD, FO, CDI, NF), (7) Introduction to desalination problems (scaling, fouling, corrosion), and their mitigation, and (8) Process Calculations and performance parameters of the main desalination processes.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to water resources & Desalination processes	1	3
Thermal Technologies: Single and Multi-Stage Flash (MSF) Technology	1	3
Process calculations and MSF performance parameters	1	3
Single and Multi-Effect Distillation (MED) Technology	1	3
Process calculations and MED performance parameters	1	3

Membrane Technologies: Osmosis and Reverse Osmosis (RO)	1	3
RO system performance parameters, Energy Recovery and pretreatment	1	3
Electro dialysis	1	3
Solar –Desalination Systems	1	3
Process calculations of Solar –Desalination Systems	1	3
Nuclear - Desalination Systems	1	3
Introduction to Future Technologies(H-DH, MD, FO, CDI, NF)	1	3
Introduction to desalination problems (scaling, fouling, corrosion), and their mitigation	1	3
Final project presentations	1	3

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42	0	0	0	0	42
	Actual	42	0	0	0	0	42
Credit	Planned	3	0	0	0	0	3
	Actual	3	0	0	0	0	3

3. Individual study/learning hours expected for students per week. 3

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Successfully apply advanced concepts of fundamental sciences and engineering to identify, formulate, and solve water and environmental engineering problems, and understand the impact of such solutions on sustainable development.	Presentation of the analysis	Lecture discussion and periodical exams
1.2	Successfully apply advanced concepts of water and environmental engineering and fundamental sciences to design, analyze, and develop	Solving the examples, problems and assignments	Assignments and exams

	technologies, processes or systems to meet desired needs of society, both, professionally and ethically		
1.3	Be knowledgeable of contemporary issues and research challenges / opportunities related to water and environmental engineering, and engage in life-long learning to keep abreast of such issues.	Discussion about practical applications	Exams, project and Homework
1.4	Use advanced techniques, skills, and modern scientific and engineering tools for problems related to professional practice in the field of water and environmental engineering.	Presentation of the analysis	Exams, project and Homework
1.5	Communicate effectively and professionally in written and oral form, both, individually and as a member of a multidisciplinary team.	Discussion about practical applications	Presentation of minor Group-project
2.0	**Cognitive Skills**		
2.1	Thinking skills, Mathematical analysis skills	Problems' solution	Examination and discussion
2.2	Problem solution skills, contact skills	Interactive internet teaching utilities and reporting.	Evaluating reports
2.3	Team working	Continues discussions in lectures	Homework assignments evaluation
3.0	**Interpersonal Skills & Responsibility**		
3.1	Groups changed for homework and reports.	Evaluation of the students' homework and reports compared with each-other	Weekly oral tests are easily showing the deficiency in short term memory and attention span
3.2	Competence between the groups with each other		
4.0	**Communication, Information Technology, Numerical**		
4.1	Memorization and engineering skills recognition.	Technical definitions	Discussion for better communication attitudes.
4.2	Internet reporting	Numerical problems in homework, exams or quizzes.	Short & quick quizzes
5.0	**Psychomotor(if any)** (not applicable)		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Homework (1)	2	2.5 %
2	Quiz (1)	4	5 %
3	Homework (2)	5	2.5 %
4	Mid-term Examination	8	20%
5	Homework (3)	9	2.5 %
6	Quiz (2)	10	5 %

7	Homework (4)	11	2.5 %
8	Oral presentation of group minor-project	13	10 %
9	Final Examination	17-18	50 %

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

At least an hour for each class/session

E Learning Resources

1. List Required Textbooks

- El-Dessouky H.T. & Ettouney H.M. Fundamentals of Salt Water Desalination, Elsevier, 2002.
- M. A. Darwish, M. M. El-Sayed , A. A. El-Sayed and S. A. Arg, "Engineering systems of water desalination, Center of Scientific Publication of King Abdul-Aziz University,Jeddah,1992.

2. List Essential References Materials (Journals, Reports, etc.)

- Essam El-Deen, "Water desalination", Academic Press, Cairo, Egypt, 2000.
- O.K.Buros, "The ABCs of desalting", International Desalination Association, USA, 2nd edition, 2002.

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

- RENEL institute home page

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

Available lecture rooms capacity of 30 students

2. Technology resources (AV, data show, Smart Board, software, etc.)

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching • Contacting students along the internet or during office hours • Periodic students' evaluation of the course and instructor • Confidential completion of standard course evaluation survey. • Focus group discussion with small (as well as large) groups of students
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Direct assessment: CLOSO based evaluation of all assessment tasks' grades for each student. • Indirect assessment: CLOSO based evaluation of student surveys. • Comparison of Direct and Indirect assessments
3. Procedures for Teaching Development • Teaching methods and strategies improvement based on direct/indirect assessments' results.
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) • Exams can be revised by the student itself to verify the grads • Students are able to revise their grades
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • Periodic peer review feedback on the quality of the course are conducted and planned remedial/improvements' actions are taken. • Based on the student's feedback and survey improvements are developed

Name of Course Instructor: Dr. Kamel Mohamed Guedri and Dr. Abdelaziz Nasr

Signature: _____ Date Completed: _____

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 17/11/208

COURSE SPECIFICATIONS

Form

Course Title: Energy storage

Course Code: 804627-3

Date: 27-10-2018.	**Institution**: Umm Al-Qura University.
College: **College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA** **Department**: Mechanical department.	

A. Course Identification and General Information

1. Course title and code: **Energy storage (804627)**
2. Credit hours:**3**
3. Program(s) in which the course is offered. Mechanical Engineering Department

   (If general elective available in many programs indicate this rather than list programs)

   MSc in Mechanical Engineering
4. Name of faculty member responsible for the course: **Dr. Abdelaziz Hassan Nasr**
5. Level/year at which this course is offered:

   Master Level/Second Semester after Joining program.
6. Pre-requisites for this course (if any):

   BSc in Mechanical engineering
7. Co-requisites for this course (if any):

   Finishing the major courses of the program
8. Location if not on main campus:

   College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	√	percentage?	90%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	√	percentage?	10%

Comments:

Other is a self-study part and report preparation in selected topics.

B Objectives

1. The main objective of this course

- To learn the Principal Forms of Stored Energy
- To learn the applications of Energy Storage
- To know the Specifying Energy Storage Devices
- To study the direct Electric Storage
- To gain the electrochemical Energy Storage
- To learn the mechanical Energy Storage
- To study the direct Thermal Storage
- To know the thermochemical Energy Storage

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

Update information about energy storage will be explored throughout Taylor & Francis, Springer and Elsevier Scientific Related Journals

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

The course provides the Principal Forms of Stored Energy, the applications of Energy Storage, the Specifying Energy Storage Devices, the Specifying Fuels, the direct Electric Storage, the electrochemical Energy Storage, the mechanical Energy Storage, the direct Thermal Storage, the thermochemical Energy Storage, the Pumped Storage Hydroelectricity (PHS), the Compressed Air Energy Storage (CAES), the Electrolysis of water and Methanation, the Hydraulic Hydro Energy Storage (HHS), the Flywheels, the Superconducting Magnetic Energy Storage (SMES).

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
1- **The Principal Forms of Stored Energy, The applications of energy storage, The Specifying Energy Storage Devices.**	3	9
2- **The direct Thermal Storage (latent heat storage, sensible heat storage)**	3	9
3- **The mechanical Energy Storage: (The Pumped Storage Hydroelectricity (PHS), The Compressed Air Energy Storage (CAES), the Flywheels)**	3	9

4- **The Hydraulic Hydro Energy Storage (HHS), the Superconducting Magnetic Energy Storage (SMES)**	2	6
5- **The direct Electric Storage, The electrochemical Energy Storage, the Electrolysis of water and Methanation**	2	6
6- **The Thermochemical Energy Storage (Biomass Solids, Ethanol, Biodiesel , Syngas,…)**	2	6
Total	15	45

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	35	10	--	--	--	45
	Actual	35	10	--	--	--	45
Credit	Planned	35	10	--	--	--	45
	Actual	35	10	--	--	--	45

3. Individual study/learning hours expected for students per week. 2

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies:

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Figure out a comprehensive knowledge and critical understanding of the main subjects of the subject matter or specialization, including the main concepts, principles, theories and their current applications in the field of academic research specializing in mechanical engineering.	*Lectures, tutorials and independent study assignments.* *Power point and video presentation on different topics.*	*Classwork, oral presentation and Homework assignments.* - *Midterm.* - *Quizzes* - *Final exam*
1.2	Understand deeply one or more areas of specific	*Lectures, tutorials and*	*Classwork, oral*

	specialization in relation to the latest theories, research and professional practice in mechanical engineering.	*independent study assignments.* *Power point and video presentation on different topics.*	*presentation and Homework assignments.* - *Midterm.* - *Quizzes* - *Final exam*
1.3	Understand how modern knowledge is composed and how it is applied, as well as the impact of modern research on knowledge stocks in mechanical engineering and related professional practices.	*Lectures, tutorials and independent study assignments.* *Power point and video presentation on different topics.*	*Classwork, oral presentation and Homework assignments.* - *Midterm.* - *Quizzes* - *Final exam*
2.0	**Cognitive Skills**		
2.1	Apply continuously theoretical and practical knowledge in dealing with a variety of contexts, new and unexpected scientific, and provide authentic and innovative responses to problems and issues. Make convincing and informed judgments in situations where complete or consistent information is not available.	*Lectures, tutorials and independent study assignments.* *Power point and video presentation on different topics.*	*Classwork, oral presentation and Homework assignments.* - *Midterm.* - *Quizzes* - *Final exam*
2.2	Extracts from published research or professional reports and can apply them, develops important new ideas and integrates them into their knowledge or experiences. Applies specialized and general research methods in the creative analysis of complex issues and in the development of results and proposals related to its academic field.		
2.3	Plan and execute large projects or part of scientific research independently, applying his theoretical and practical knowledge and using research methods to arrive at valuable conclusions that lead to important additions to current knowledge or professional practices.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Initiate the identification and creative handling of complex issues and problems in academic contexts. Act independently, when additional information or skills are needed, by searching for and applying the required information and skills.	*Lectures, tutorials and independent study assignments.* *Power point and video presentation on different topics.*	*Classwork, oral presentation and Homework assignments.* - *Midterm.* - *Quizzes* - *Final exam*
3.2	Take fully responsibilities for his work, and cooperate fully and constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in		

	ways that always stimulate the effectiveness of the group as a whole in collective situations.		
3.3	Deals permanently and sensitively with complex ethical issues in academic or professional positions. Issue sound, fair and informed judgments based on well-known principles and values in cases that have not been thoroughly addressed in ethical standards, codes of practice or regulations. Issues fair and sound judgments based on informed knowledge and based on established principles and values. Points out the shortcomings in existing standards and practice to try to revise and reform them.	*Lectures, tutorials and independent study assignments.* *Power point and video presentation on different topics.*	*Classwork, oral presentation and Homework assignments.* - *Midterm.* - *Quizzes* - *Final exam*
4.0	**Communication, Information Technology, Numerical**		
4.1	Obtain and performs statistical and mathematical data in a critical and efficient manner. Use a wide range of appropriate information and communication technologies to examine issues and communicate findings and recommendations.	*Lectures, tutorials and independent study assignments.* *Power point and video presentation on different topics.*	*Classwork, oral presentation and Homework assignments.* - *Midterm.* - *Quizzes* - *Final exam*
4.2	Obtain and performs statistical and mathematical data in a critical and efficient manner. Use a wide range of appropriate information and communication technologies to examine issues and communicate findings and recommendations.		
5.0	**Psychomotor(if any)** (not applicable)		
5.1	Not applicable		
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	**quizzes**	3, 7	10%
2	**group project**	4, 10	10%
3	**oral presentation**	5	10%
4	**Medterm examination**	8	20%
5	**Final examination**	16	50%
7			
8			

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Meetings and discussions on Blackboard
Weekly office hours

E Learning Resources

1. List Required Textbooks

- Power plant Technology: M.M. EI-Wakil
- Energy Conversion: D. Yogi Goswami, Frank Kreith
- Energy Storage Technologies & Their Role in Renewable Integration: Andreas Oberhofer Research Associate, Global Energy Network Institute (GENI)

2. List Essential References Materials (Journals, Reports, etc.)

- EAC. 2017. High Penetration of Energy Storage Resources on the Electricity System; EAC. 2016. 2016 Storage Plan Assessment; EAC. 2013. A National Grid Energy Storage Strategy.
- Umweltbundesamt Für Mensch Und Umwelt. Energieziel 2050: 100% Strom Aus Erneuerbaren Quellen. FKZ 363 01 277. July 2010. Web. 18 Apr. 2012.
- "Renewable Energy and Electricity." World-nuclear.org. Web. 18 Apr. 2012. .
- "Neue Speicher Für Die Energiewende." Energy-storage-online.com. Web. 18 Apr. 2012.
- "Factsheet to Accompany the Report "Pathways for Energy Storage in the UK"."Lowcarbonfutures.org. Web. 30 Apr. 2012.
- Gatzen, Christoph. The Economics of Power Storage. Vol. 65. München: Oldenbourg Industrieverlag, 2008. Web. 30 Apr. 2012.
- "About Flywheel Energy Storage." Beaconpower.com. Web. 24 Apr. 2012.
- "Pros and Cons of a Lead Acid Car Battery." CarsDirect.com. 28 May 2010. Web. 23 Apr. 2012.
- "Fraunhofer: Riesen-Batterien Für Ökostrom-Speicherung." Energie-und-technik.de. 28 Mar. 2011. Web. 14 May 2012.
- "Lead Acid Batteries." BatterySpace.com. Web. 20 Apr. 2012.

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

-http://science.howstuffworks.com/environmental/energy/power.htm
-http://www.powertogas.info/power-to-gas/strom-speichern.html
- http://www.world-nuclear.org/info/inf10.html
-http://www.energy-storage-online.de/neue_speicher_fuer_die_energiewende.php?Page=1
-http://inventors.about.com/od/bstartinventions/ss/How-A-Battery-Works.htm
-http://www.vonwentzel.net/Battery/00.Glossary/
-http://www.batterystuff.com/kb/articles/battery-articles/secret-workings-of-a-lead-acid-battery.html
-http://www.carsdirect.com/car-maintenance/pros-and-cons-of-a-lead-acid-car-

battery *-http://www.beaconpower.com/products/about-flywheels.asp* *-http://www.tab-beim-bundestag.de/de/pdf/publikationen/berichte/TAB-Arbeitsbericht-ab123.pdf* *- http://harald-rossa.suite101.de/auf-dem-weg-zur-supraleitung-bei-raumtemperatur-a54534* *-http://www.lowcarbonfutures.org/assets/media/SMES_final.pdf* *- http://www.elektronik-kompendium.de/sites/bau/0810281.htm* *-http://electronics.howstuffworks.com/everyday-tech/lithium-ion-battery.htm* *- http://www.youtube.com/watch?v=ueoSvlB9y5s* *-http://batteryuniversity.com/partone-5-german.htm* *- http://www.ibm.com/smarterplanet/us/en/smart_grid/article/battery500.html* *- http://www.basf.com/group/corporate/de/news-and-media-relations/podcasts/chemistry-of-innovations/lithium-ion* *http://www.zswbw.de/fileadmin/ZSW_files/Infoportal/Informationsmaterial/docs/Risikoanalyse%20Lithium_05_08_2010.pdf* *- http://www.americanvanadium.com/vanadium-flow-batteries.php* *-http://www.sustainableplant.com/2012/05/vanadium-flow-battery-to-provide-grid-level-storage-for-gills-onions/* *-http://www.shetlandtimes.co.uk/2011/11/25/danger-of-lerwick-battery-fire-forces-sse-to-halt-connection*
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. *According the class requirements*

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) *Class room (with Data show & white board)*
2. Technology resources (AV, data show, Smart Board, software, etc.) *data show*
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) *None*

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *- Focus group discussion with small groups of students* *- Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *Revising literature for new information.*
3. Procedures for Teaching Development

Analysis of questionnaires and exam results at Department Councils.
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) *Analysis of questionnaires and exam results at Department Councils.*
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *After each semester it will be taught, improvement process according to course report may be performed.*

Name of Course Instructor: Abdelaziz Hassan Nasr

Signature:  **Date Completed: 27-10-2018**

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 17/11/2018

COURSE SPECIFICATIONS

Form

Course Title: Intermediate Fluid Mechanics

Course Code: 804634-3

Date: 20 18–27–11.	**Institution**: Umm Al-Qura University
College: . College of Engineering & Islamic Architecture	**Department**: Mechanical Engineering department

A. Course Identification and General Information

1. Course title and code: Advanced Fluid Mechanics, 804634-3
2. Credit hours: 3
3. Program(s) in which the course is offered. Mechanical Engineering Program

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course Dr. Abdulmannan A. Saati
5. Level/year at which this course is offered: Fall 2019-2020
6. Pre-requisites for this course (if any): Undergraduate Fluid Mechanics
7. Co-requisites for this course (if any):
8. Location if not on main campus: All sections are taught in the same location on the main campus
9. Mode of Instruction (mark all that apply):

a. Traditional classroom		percentage?	80
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	20
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course: To review fundamental concepts of fluid mechanics thoroughly and extend them in the first part of the course; to introduce advanced topics and solution techniques in the second part. To strengthen and unify the diligent student's background in fluid mechanics; and to prepare him/her to read the current literature in fluid mechanics and to pursue advanced studies in the subject.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Fluid properties. Basic laws for a control volume. Kinematics of fluid flow. Dynamics of frictionless incompressible flow and basic hydrodynamics. Equations of motion for viscous flow, viscous flow applications, boundary-layer theory. Wall turbulence, lift and drag of immersed bodies.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Fluid properties and other preliminary concepts	1	3
Basic laws for a control volume	2	6
Kinematics of fluid flow	1	3
Dynamics of frictionless and incompressible flow	1	3
Basic hydrodynamics and equations of motion of viscous flow	1	3
Exact solutions of viscous-flow equations and their applications	2	6
Boundary-layer theory	2	6
Lift and drag on immersed bodies	2	6
Incompressible turbulent flows and wall turbulence	2	6

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42					42
	Actual	42					42
Credit	Planned	3					3
	Actual	3					3

3. Individual study/learning hours expected for students per week. 12

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Ability to define and look up fluid property	Lectures & Exercise	Assignments
1.2	Ability to state basic laws for a control volume in different coordinate systems.	Lectures & Exercise	Assignments
1.3	Ability to derive the kinematics of fluid flow in problem solving.	Lectures & Application project	Assignments
1.4	Ability to derive the equations for frictionless and incompressible flows.	Lectures & Application project	Assignments & Midterm project report.
1.5	Ability to derive the basic equations for motion of viscous flows.	Lectures & Application project	Assignments & Final Project
1.6			
2.0	**Cognitive Skills**		
2.1	Ability to find standard exact solutions of viscous flow equations	Lectures & Exercise	Assignments
2.2	Ability to drive and solve some basic equations of boundary layer theory	Project	Assignments
2.3	Ability to find lift and drag forces on immersed bodies with simple shapes	Lectures & Final Project	Assignments & Final Project
3.0	**Interpersonal Skills & Responsibility**		
3.1			
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1			
4.2			
5.0	**Psychomotor(if any)**		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Assignments		50%
2	Midterm project report.		20%
3	The final project report and discussions.		30%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

E Learning Resources

1. List Required Textbooks *Viscous Fluid Flow,* Frank M. White, Third Edition, McGraw Hill (2008)
2. List Essential References Materials (Journals, Reports, etc.) Incompressible Flow, 3rd edition, by R. L. Panton (2005) Boundary Layer Theory, 8th edition, by H. Schlichting & K. Gersten (2000). An Album of Fluid Motion, 12th edition, by M. Van Dyke (1982)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Classrooms and laboratories
2. Technology resources (AV, data show, Smart Board, software, etc.) commercial software. Such as COMSOL MATLAB.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) NAN

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching There will be a number of assignments given throughout the course. There is a course project. There are no exams. The final grade will be based on marks obtained for the assignments and the course project. The composition of the grade: (1) 50% for the assignments and (2) 50% for the course project where 20% midterm project report and 30% for the final project report and discussions.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department Final Project & presentation: Oral Exam evaluated by an independent member teaching staff
3. Procedures for Teaching Development

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) check marking by an independent member teaching staff of a sample of student's work
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. Based on **Course Assessment and CLO will be developed.**

Name of Course Instructor: Dr. Abdulmannan A. Saati

Signature: _____ Date Completed: _____

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018/11/17

COURSE SPECIFICATIONS

Form

Course Title: Energy Management and Conservation

Course Code: 804629-3

Date: 23–10–2018.	**Institution**: Umm Al-Qura University
College: Engineering and Islamic Architecture **Department**: Mechanical Engineering	

A. Course Identification and General Information

1. Course title and code: Energy Management and Conservation 804629-3
2. Credit hours: 3
3. Program(s) in which the course is offered. M.Sc. in Mechanical Engineering

   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course Professor: Dr. Muhammad N. Radhwi
5. Level/year at which this course is offered: Fifth level
6. Pre-requisites for this course (if any): M. Sc. Status
7. Co-requisites for this course (if any): None
8. Location if not on main campus: Main campus
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	✓		percentage?	100
b. Blended (traditional and online)			percentage?	
c. E-learning			percentage?	
d. Correspondence			percentage?	
f. Other			percentage?	

Comments:

B Objectives

1. The main objective of this course: Improve student's abilities to utilize energy management and conservation concepts in existing as well as proposed mechanical operations.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description: Introduction to Energy management and conservation, audits, standards, operation and maintenance – Mechanical systems/components – Boilers/Furnaces – Turbines/IC engines - Heat exchangers – Energy management thermal and economic calculations - Real life energy recovery solutions term project (RLERS). Emphasis on real life examples is required for each topic.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
1. Energy management (1): definition, audits, standards, LEED, operation and maintenance, building types.	2	6
2. Energy management (2): power producing, efficiency, waste, recovery.	2	6
3. Mechanical system/components: HVAC systems, domestic hot water systems, pumps, fans, compressors, lighting systems.	3	9
4. Boilers/Furnaces: firing periods, flue gas analysis, stack temperature, air/fuel ratio, operating procedures.	1.5	4.5
5. Turbines/IC engines: types, operating theory, testing, maintenance, energy losses.	1.5	4.5
6. Heat exchangers: types, design, sizing, fouling, cleaning, repair.	2	6
7. Energy management thermal and economic calculations: efficiency measurements and improvements (power production, heating/cooling, pumps, fans, lighting systems), degree day method, economic feasibility.	4	12

2. Course components (total contact and credit hours per semester):

	Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total

Contact Hours	Planned	48					48
	Actual	48					48
Credit	Planned	3					3
	Actual	3					3

3. Individual study/learning hours expected for students per week. 6 hours

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Deep Understanding of the basic concept, principles and theories of energy management including standards/codes and energy surveys.	• Lectures: given on topics as class progress, with especial consideration within the class to link the existing topic with students' existing knowledge and further with the general overview. • Review: review the content of each lecture and clarify any matters not clear to make sure comprehensive and deep understanding of the topics concepts, principles, theories and applications to local as well as global environments in the field of energy management and conservation.	As class/topics progress, assignments/homework are assigned and fill-in-blank knowledge items on the midterm and final exams are given.
1.2	Deep Understanding of the basic concept, principles, theories and ability to analyze energy management opportunities, operation/maintenance changes in mechanical applications and layout facilities according to energy management view point.		
1.3	Deep Understanding of the basic concept, principles, theories and ability to perform calculations for measuring energy utilization and conservation in mechanical applications including energy efficiencies and degree day calculations.		
1.4	Deep Understanding of the basic concept, principles, theories and ability to make energy audits and diagnostic analysis including thermal and economic analysis.		

1.5	Able to perform a real life energy recovery and conservation solutions project in mechanical systems including modern knowledge application and realization to recent regulations/procedures locally as well as internationally.	Real life Case Study Project: Small groups of students (around 4) are assigned to join in a team work; which includes selecting a real life case study project proposed by team members, perform and continue to cover the project in parallel to related class lectures, present weekly updates, present the final work to class and submit the final professional report (the work, which should be completed by week 15, involves generating/collecting data, look up of reference materials, websites and use of computing analysis software).	Each student required to present periodic updates and the final work of the project to class (five updates and a final presentation, involves students actual contribution to the project and reflecting his independent research abilities). In addition, a final professional report of the project for the team work is submitted at the end of the term.
2.0	**Cognitive Skills**		
2.1	Ability to apply continuously theoretical/practical knowledge of energy management and conservation concepts and techniques in solving/designing energy management and conservation problems of various systems in an integrated knowledge/experience environment and in a variety of context.	• Extensive engineering application examples given in lectures along with class materials as class progress. • Learning encouraged by use of analytical tools in different applications and through discussion of potential application in other areas. • Assignment tasks include some open ended tasks designed to use real life data, reference materials and apply predictive, analytical and problem solving approach.	• Problem solving questions are given at the end of each topic, on midterm exam and on end of semester final examination. • Real life Case Study Project requires application of analytical tools in problem solving tasks in a variety of contexts.
2.2	Able to perform large-scale scientific work independently by applying students' knowledge/experience.		
3.0	**Interpersonal Skills & Responsibility**		
3.1			
3.2			
4.0	**Communication, Information Technology, Numerical**		

4.1	Ability to communicate and use techniques and modern engineering tools effectively using real life data analysis and energy management and conservation concept/information.	In the real life case study, students required to make periodic updates, a full scale final presentation of the work to class and submit a written professional report, which require proper style and referencing format as specified in graduate study manual.	Assessments of students assignment work include expectation of adequate use of numerical and communication skills, in addition to interpretation of collected data and information.
4.2			
5.0	**Psychomotor(if any)**		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Real life case study Project update 1	3	2%
2	Real life case study Project update 2	6	2%
3	Mid-Term Test	8	15%
4	Real life case study Project update 3	9	2%
5	Real life case study Project update 4	12	2%
6	Real life case study Project update 5	14	2%
7	Final Presentation for the Real life case study Project	15	10%
8	Final Professional Report for the Real life case study Project	15	30%
9	Final Test	16	35%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week): At least an hour for each class/session.

E Learning Resources

1. List Required Textbooks • Vanek, F. and Albright, L., Energy Systems Engineering Evaluation and Implementation, 2nd edition, McGraw-Hill Book Co., 2012. • Sharma, K. V. and Venkataseshaiah, P., Energy Management and Conservation, I.K. International Publishing House Pvt. Ltd., 2011.
2. List Essential References Materials (Journals, Reports, etc.) • Rajan, G. G., Practical Energy Efficiency Optimization, McGraw-Hill Book Co., 2006. • ASHRAE Handbook - Fundamentals, ASHRAE Inc., 2017.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) • A lecture room with a capacity of 35 students per session is reasonable.
2. Technology resources (AV, data show, Smart Board, software, etc.) • Computer access of a PC with Microsoft office installed.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching • Confidential completion of standard course evaluation survey. • Focus group discussion with small (as well as large) groups of students.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Direct assessment: evaluation of all assessment tasks' grades for each student. • Indirect assessment: evaluation of student surveys. • Comparison of Direct and Indirect assessments.

3. Procedures for Teaching Development • Based on direct/indirect assessments' results and confidential surveys/focus group discussion results, improvement actions are taken (including teaching methods and strategies).
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) • Samples of graded examination papers and assignment tasks are check marked by an independent member teaching staff.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • Periodic peer review feedback on the quality of the course are conducted and planned remedial/improvements' actions are taken.

Name of Course Instructor: Professor Dr. Muhammad N. Radhwi
Signature: _____ Date Completed: October 27, 2018

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018/11/17

COURSE SPECIFICATIONS

Form

Course Title: **Power Plants Technology**

Course Code: **804630-3**

Date: 02-11-.2018.	**Institution**: Umm Al Qura University
College: College of Engineering and Islamic Architecture, Umm Al-Qura University - Makkah, KSA **Department**: Mechanical Dept.	

A. Course Identification and General Information

1. Course title and code: **Power Plants Technology – 804630-3**
2. Credit hours: **3**
3. Program(s) in which the course is offered.

   MSc in Mechanical Engineering
4. Name of faculty member responsible for the course

   Prof. Dr. Adel Mohamed Abdelkader Abdeen
5. Level/year at which this course is offered:

   Master Level/Second Semester after Joining program.
6. Pre-requisites for this course (if any):

   BSc in Mechanical engineering
7. Co-requisites for this course (if any):

   Finishing the major courses of the program
8. Location if not on main campus: : **College of Engineering and Islamic Architecture, Umm Al-Qura University - Makkah, KSA**
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	■	percentage?	80%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	20%

Comments:

Other is a self-study part and report preparation in selected topics.

B Objectives

1. The main objective of this course

the end of the course the students will be able to:-

- *Advanced knowledge of thermodynamics*
- *Demonstrate knowledge of power generation plants*
- *Design of thermal systems and components in steam power plants*
- *Study of Gas-turbine and combined cycle plants*
- *Demonstrate the renewable energy power plants*
- *Modeling and Simulation of power plants*

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

- *Through the presentation of the students to follow the updated topics in the field area using online materials.*

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

The course is aimed to strength the knowledge of the thermodynamics to the students. Performance improvement of plants is a target of the course. The course is focusing on the design of both steam and gas turbines plants. It is considering the design of the plant components like boilers, turbines, compressors, condensers and pumps. Solar and nuclear power plants are also explained. Modeling and simulation of the different plants are studied to investigate the plants performance and design process.

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1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Revision of thermodynamics	1	3
Rankine cycle analysis	2	6
Brayton cycle and combined power plants	2	6
Low temperature power cycles	1	3
Nuclear Power Plants	1	3
Solar Power Plants	1	3
Design of steam Generators	2	6
Design of gas and steam turbines	2	6
Design of the steam condensers	1	3
Selection and design of compressors and pumps	2	6
Total	15	45

2. Course components (total contact and credit hours per semester):							
		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30	15				45
	Actual	30	15				45
Credit	Planned	30	15				45
	Actual	30	15				45

3. Individual study/learning hours expected for students per week.	3

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Figure out a comprehensive knowledge and critical understanding of the main subjects of the subject matter or specialization, including the main concepts, principles, theories and their current applications in the field of academic research specializing in mechanical engineering.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
1.2	Understand deeply one or more areas of specific specialization in relation to the latest theories, research and professional practice in mechanical engineering.		
2.0	**Cognitive Skills**		
2.1	Apply continuously theoretical and practical knowledge in dealing with a variety of contexts, new and unexpected scientific, and provide authentic and innovative responses to problems and issues. Make convincing and informed judgments in situations where complete or consistent information is not available.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
2.3	Plan and execute large projects or part of scientific research independently, applying his		

	theoretical and practical knowledge and using research methods to arrive at valuable conclusions that lead to important additions to current knowledge or professional practices.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Initiate the identification and creative handling of complex issues and problems in academic contexts. Act independently, when additional information or skills are needed, by searching for and applying the required information and skills.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
3.2	Take fully responsibilities for his work, and cooperate fully and constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations.		
3.3	Deals permanently and sensitively with complex ethical issues in academic or professional positions. Issue sound, fair and informed judgments based on well-known principles and values in cases that have not been thoroughly addressed in ethical standards, codes of practice or regulations. Issues fair and sound judgments based on informed knowledge and based on established principles and values. Points out the shortcomings in existing standards and practice to try to revise and reform them.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicates effectively and at an appropriate level with academic recipients and the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Quiz and Exercise	All along	10%
2	Report & Presentation	3-5	10%
3	Assignments	3, 7 and 11	10%
4	Mid-term	7	20%

5	Term Project	14	10%
6	Final exam	16	40%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

- ***Weekly office hours***
- ***Meetings and discussions on Blackboard***

E Learning Resources

1. List Required Textbooks

- Dipak Sarkar, Thermal Power Plant: Design and Operation 1st Edition, *copyright 2015 Elsevier Inc.*, **ISBN-10:** 9780128015759.
- Kam W. Li, Power Plant System Design 1st Edition, WILEY; 1 edition (February 22, 1985), ISBN-13: 978-0471888475.

2. List Essential References Materials (Journals, Reports, etc.)

Journal of Power Technologies, *Solar energy*

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

https://www.amazon.com/ & *www.sciencedirect.com* & *www.springer.com*

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

According the class requirements

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

Class room (with Data show & white board)

2. Technology resources (AV, data show, Smart Board, software, etc.)

Data show

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

nothing

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

Questionnaire & Oral Discussion

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department

laboratories to attain updated equipment.
Revising literature for new information.

3. Procedures for Teaching Development

laboratories to attain updated equipment. Revising literature for new information.

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) *Analysis of questionnaires and exam results at Department Councils.*
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. *Improvement process according to course report may be performed*.

Name of Course Instructor:
Prof. Dr. Adel Mohamed Abdelkader Abdeen

_____

Signature: _ Adel Mohamed _ Date Completed: 02.11.2018

Program Coordinator: Prof Mohamed Korrany
Signature: _____ Date Received: 17/11/2018

COURSE SPECIFICATIONS

Form

Course Title: Advanced Heat Transfer

Course Code: 804631-3

Date: 20.. 18…–…11…–..1.	**Institution**: Umm Al-Qura University
College: CEIA	**Department**: Mechanical Engineering

A. Course Identification and General Information

1. Course title and code: Advanced Heat Transfer; 804631-3
2. Credit hours: 3
3. Program(s) in which the course is offered.

   (If general elective available in many programs indicate this rather than list programs)

   Mechanical Engineering Department
4. Name of faculty member responsible for the course

   Dr. Eng. Kamel Mohamed Guedri
5. Level/year at which this course is offered:
6. Pre-requisites for this course (if any):
7. Co-requisites for this course (if any): None
8. Location if not on main campus: None
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	■	percentage?	100%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

Upon completion of this course, the students should be able to:

1. Understand the limits of macroscopic heat transfer based on continuum and classical equilibrium assumptions
2. Be knowledgeable of the Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics
3. Understand the concept of energy quantization
4. Be able to describe the classical transport coefficients via the kinetic theory
5. Be able to formulate the Boltzmann transport equation
6. Be able to identify the appropriate equations for solving heat conduction problems at prescribed length and time scales
7. Understand the Maxwell equations and electromagnetic wave propagation
8. Understand the concepts of total internal reflection, evanescent waves and surface polaritons
9. Understand fluctuational electrodynamics applied to thermal radiation emission and be able to apply the fluctuation-dissipation theorem
10. Be able to solve near-field thermal radiation problems in planar geometry
11. Be able to formulate near-field thermal radiation problems in 3D complex geometries

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description: This course will cover microscopic concepts and methodology in energy transport at micro/nanoscale, including equilibrium statistics, Boltzmann transport equation, and nano/microscale heat conduction and radiation, with applications in contemporary technologies. Lectures will cover fundamental theories and applications, while this course will emphasize a term project to incubate the independent research abilities of students.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to micro/nanoscience and technology	0.5	1.5
Statistical mechanics and equilibrium distributions, quantum statistics	1	3
Specific heat of ideal gas	0.5	1.5
Quantum mechanics basics	1	3
Basic kinetic theory and transport properties of idea gases	0.5	1.5

Boltzmann transport equation	1	3
Microfluidics and microscale convection heat transfer	1	3
Properties of solids: specific heat an quantum size effects	0.5	1.5
Thermal conductivity of solids	0.5	1.5
Thermoelectricity and applications	1	3
Quantum thermal conductance, thin films and size effect	1	3
Introduction to solid state physics	0.5	1.5
Non-Fourier and non-equilibrium heat conduction (hyperbolic heat equation, ultrafast laser heating, phonon radiative transfer, boundary thermal resistance)	2	6
Micro/nanoscale thermal radiation: history of thermal radiation and derivation of Planck's law	1	3
Maxwell's law and radiative properties	1.5	3
Radiative properties of nanostructures	1	3
Nanophotonics, photon-tunneling, and near-field radiative transfer	0.5	1.5
Student Presentation	1	3

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42	0	0	0	0	42
	Actual	42	0	0	0	0	42
Credit	Planned	3	0	0	0	0	3
	Actual	3	0	0	0	0	3

3. Individual study/learning hours expected for students per week. 3

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Understand the limits of macroscopic heat transfer based on continuum and classical equilibrium assumptions	Presentation of the analysis	Lecture discussion and

			periodical exams
1.2	Be knowledgeable of the Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics	Solving the examples, problems and assignments	Assignments and exams
1.3	Be able to formulate the Boltzmann transport equation and identify the appropriate equations for solving heat conduction problems at prescribed length and time scales	Discussion about practical applications	Exams, project and Homework
1.4	Understand the Maxwell equations, electromagnetic wave propagation, and the concepts of total internal reflection, evanescent waves and surface polaritons	Presentation of the analysis	Exams, project and Homework
1.5	Understand fluctuational electrodynamics applied to thermal radiation emission and be able to apply the fluctuation-dissipation theorem	Solving the examples, problems and assignments	Assignments and exams
1.6	Be able to formulate near-field thermal radiation problems in 3D complex geometries	Solving the examples, problems and assignments	Assignments and exams
2.0	**Cognitive Skills**		
2.1	Thinking skills, Mathematical analysis skills	Problems' solution	Examination and discussion
2.2	Problem solution skills, contact skills	Interactive internet teaching utilities and reporting.	Evaluating reports
2.3	Team working	Continues discussions in lectures	Homework assignments evaluation
3.0	**Interpersonal Skills & Responsibility**		
3.1	Groups changed for homework and reports.	Evaluation of the students' homework and reports compared with each-other	Weekly oral tests are easily showing the deficiency in short term memory and attention span
3.2	Competence between the groups with each other		
4.0	**Communication, Information Technology, Numerical**		
4.1	Memorization and engineering skills recognition.	Technical definitions	*Discussion for better communication attitudes.*
4.2	Internet reporting	Numerical problems in homework, exams or quizzes.	Short & quick quizzes
5.0	**Psychomotor(if any)** (not applicable)		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Homework (1)	2	2.5 %
2	Quiz (1)	4	5 %

3	Homework (2)	5	2.5 %
4	Mid-term Examination	8	20%
5	Homework (3)	9	2.5 %
6	Quiz (2)	10	5 %
7	Homework (4)	11	2.5 %
8	Oral presentation of group minor-project	13	10 %
9	Final Examination	15	50 %

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

At least an hour for each class/session

E Learning Resources

1. List Required Textbooks

Z.M. Zhang, Nano/Microscale Heat Transfer, McGraw-Hill, New York, 2007.

2. List Essential References Materials (Journals, Reports, etc.)

- C.L. Tien, A. Majumdar, and F.M. Gerner (eds.), Microscale Energy Transport, Taylor & Francis, Washington DC, 1998.
- G. Chen, Nanoscale Energy Transport and Conversion, Oxford University Press, New York, 2005.
- M. Kaviany, Heat Transfer Physics, Cambridge, 2008

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

Available lecture rooms capacity of 30 students

2. Technology resources (AV, data show, Smart Board, software, etc.)

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching
   - Contacting students along the internet or during office hours
   - Periodic students' evaluation of the course and instructor
   - Confidential completion of standard course evaluation survey.
   - Focus group discussion with small (as well as large) groups of students

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
   - Direct assessment: CLOSO based evaluation of all assessment tasks' grades for each student.
   - Indirect assessment: CLOSO based evaluation of student surveys.
   - Comparison of Direct and Indirect assessments

3. Procedures for Teaching Development
   - Teaching methods and strategies improvement based on direct/indirect assessments' results.

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)
   - Exams can be revised by the student itself to verify the grads
   - Students are able to revise their grades

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.
   - Periodic peer review feedback on the quality of the course are conducted and planned remedial/improvements' actions are taken.
   - Based on the student's feedback and survey improvements are developed

Name of Course Instructor: Dr. Kamel Mohamed Guedri

Signature: _____ Date Completed: _____

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018/11/17

COURSE SPECIFICATIONS

Form

Course Title: Biofuels, Biomass and Waste Energy

Course Code: 804632-3

Date: 20.. 18…–…11…–..1.	**Institution**: Umm Al-Qura University
College: CEIA	**Department**: Mechanical Engineering

A. Course Identification and General Information

1. Course title and code: Biofuels, Biomass and Waste Energy; 804632-3

2. Credit hours: 3

3. Program(s) in which the course is offered.

(If general elective available in many programs indicate this rather than list programs)

Mechanical Engineering Department

4. Name of faculty member responsible for the course

Dr. Eng. Kamel Mohamed Guedri

5. Level/year at which this course is offered:

6. Pre-requisites for this course (if any):

7. Co-requisites for this course (if any): None

8. Location if not on main campus: None

9. Mode of Instruction (mark all that apply):

a. Traditional classroom	■	percentage?	100%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

This is an introductory course focusing on the scope of valorization of waste made from nonpetroleum sources (biomass). The source, processing, and social impacts of biofuel utilization will be covered.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description: We are currently facing both energy and environmental challenges. In this course, we will explore how biofuels offer potential solutions to these issues. Biofuels is an interdisciplinary topic, so we will investigate the science and engineering, economics, societal impacts and the political aspects of biofuels including both ethanol and biodiesel. The course will provide a broad understanding of the impacts and implications of biofuels use through an investigation of: (1) The viability of various biofuels for transportation; (2) The engineering and science of fuel production and use; (3) The economics of biofuels production and use; (4) The environmental impacts of both ethanol and biodiesel; and (5) The policies and environmental issues driving the use of biofuels as well as the societal impacts.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Carbon in our environment	0.5	1.5
Introduction to Biofuels	0.5	1.5
Combustion Engines Part 1. Parts and Function	0.5	1.5
Combustion Engines Part 2. Turbines and Fuel Ratings	0.5	1.5
Alcohol Fuels Part 1.Attributes and History	0.5	1.5
Alcohol Fuels Part 2. Characteristics	0.5	1.5
Alcohol Fuels Part 3. Ethanol Production	1	3
Alcohol Fuels Part 4. Cellulosic Ethanol and Methanol	0.5	1.5
Alcohol Fuels Part 5. Butanol	0.5	1.5
Biodiesel Part 1.Petrodiesel	0.5	1.5
Biodiesel Part 2. Terms and Properties	0.5	1.5
Biodiesel Part 3. Making Biodiesel	1	3
Biodiesel Part 4. Oil Sources	0.5	1.5
Biodiesel Part 5. Straight Vegetable Oil	0.5	1.5

Biodiesel Part 6. Co-uses for Oilseed	0.5	1.5
Gasification Part 1. Biomass	1	3
Gasification Part 2. Producer Gas	1	3
Biogas Part 1. Biology	0.5	1.5
Biogas Part 2. Feed Selection	0.5	1.5
Biogas Part 3. Fuel Value and Properties	0.5	1.5
Biogas Part 4 Uses	1	3
Fuel Conversion and Future Technology	1	3

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42	0	0	0	0	42
	Actual	42	0	0	0	0	42
Credit	Planned	3	0	0	0	0	3
	Actual	3	0	0	0	0	3

3. Individual study/learning hours expected for students per week. 6

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	How petroleum and bio-based fuels affect the global carbon cycle	Presentation of the analysis	Lecture discussion and periodical exams
1.2	The attributes of biofuels that make them suitable as a fuel for a specific application	Solving the examples, problems and assignments	Assignments and exams
1.3	Limitations of biofuels	Discussion about practical applications	Exams, project and Homework
1.4	Global impacts of biofuels on food and energy supplies	Presentation of the analysis	Exams, project and Homework

1.5	Technological advances and challenges to be overcome for wide-scale biofuel adoption	Solving the examples, problems and assignments	Assignments and exams
2.0	**Cognitive Skills**		
2.1	Thinking skills, Mathematical analysis skills	Problems' solution	Examination and discussion
2.2	Problem solution skills, contact skills	Interactive internet teaching utilities and reporting.	Evaluating reports
2.3	Team working	Continues discussions in lectures	Homework assignments evaluation
3.0	**Interpersonal Skills & Responsibility**		
3.1	Groups changed for homework and reports.	Evaluation of the students' homework and reports compared with each-other	Weekly oral tests are easily showing the deficiency in short term memory and attention span
4.0	**Communication, Information Technology, Numerical**		
4.1	Memorization and engineering skills recognition.	Technical definitions	*Discussion for better communication attitudes.*
4.2	Internet reporting	Numerical problems in homework, exams or quizzes.	Short & quick quizzes
5.0	**Psychomotor(if any)** (not applicable)		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Homework (1)	2	2.5 %
2	Quiz (1)	4	5 %
3	Homework (2)	5	2.5 %
4	Mid-term Examination	8	20%
5	Homework (3)	9	2.5 %
6	Quiz (2)	10	5 %
7	Homework (4)	11	2.5 %
8	Oral presentation of group minor-project	13	10 %
9	Final Examination	15	50 %

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week) At least an hour for each class/session

E Learning Resources

1. List Required Textbooks Rattan Lal, B.A. Stewart. Soil Quality and Biofuel Production, CRC Press Reference - 222 Pages - 37 B/W Illustrations, 2009.
2. List Essential References Materials (Journals, Reports, etc.) Pandey, Larroche, Ricke, Dussap, Gnansounou. Biofuels, 1st Edition Alternative Feedstocks and Conversion Processes, 2011.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Available lecture rooms capacity of 30 students
2. Technology resources (AV, data show, Smart Board, software, etc.)
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching • Contacting students along the internet or during office hours • Periodic students' evaluation of the course and instructor • Confidential completion of standard course evaluation survey. • Focus group discussion with small (as well as large) groups of students
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Direct assessment: CLOSO based evaluation of all assessment tasks' grades for each student. • Indirect assessment: CLOSO based evaluation of student surveys. • Comparison of Direct and Indirect assessments

3. Procedures for Teaching Development • Teaching methods and strategies improvement based on direct/indirect assessments' results.
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) • Exams can be revised by the student itself to verify the grads • Students are able to revise their grades
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • Periodic peer review feedback on the quality of the course are conducted and planned remedial/improvements' actions are taken. • Based on the students feedback and survey improvements are developed

Name of Course Instructor: Dr. Kamel Mohamed Guedri

Signature: _____ Date Completed: _____

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018/11/17

COURSE SPECIFICATIONS

Form

Course Title: **Turbomachinery**

Course Code: **804633-3**

Date: 18-10-.2018.	**Institution**: Umm Al Qura University
College: College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA **Department**: Mechanical Dept.	

A. Course Identification and General Information

1. Course title and code: **Turbomachinery – 804633-3**
2. Credit hours: **3**
3. Program(s) in which the course is offered.

   MSc in Mechanical Engineering
4. Name of faculty member responsible for the course

   Assoc. Prof. Mohamed Hassan Ahmed Mohamed
5. Level/year at which this course is offered:

   Master Level/Second Semester after Joining program.
6. Pre-requisites for this course (if any):

   BSc in Mechanical engineering
7. Co-requisites for this course (if any):

   Finishing the major courses of the program
8. Location if not on main campus: : **College of Engineering and Islamic Architecture, Umm Al-Qura University - Mecca, KSA**
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	■	percentage?	80%
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	20%

Comments:

Other is a self-study part and report preparation in selected topics.

B Objectives

1. The main objective of this course

• *To give sufficient knowledge about the turboumachines, such as turbines, compressors, Fans, pumps and blowers.*
• *To equip students in working with projects and to take up research work in connected areas.*

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

- *Update information about Turbomachines will be explored throughout ASME, Elsevier and Springer Scientific Related Journals.*
- *Use of data show presentation and video section (Very important)*

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Introduction on the types of turbomachines, Basics ,Classification- Major components, compressors& turbine expanders - Turbomachines and aerothermodynamics , aerothermal equations, Efficiencies, Dimensionless analysis, Performance – Centrifugal compressor concepts, Performance, Compressor surge – Axial flow compressor, Blades & cascade definitions, Elementary airfoil theory, Laminar flow airfoil, Velocity triangle, degree of reactions Radial equilibrium, Diffusion factor, Performance characteristics- Radial-inflow turbines, Theory, Turbine design considerations, Performance characteristics – Axial flow turbines, turbine geometry, Reaction turbines , Blades cooling concepts, Turbine aerodynamics –Performance computations, pumps, characteristic curve of the pump, pump selection, Cavitation.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction on the types of turbomachines, Basics ,Classification- Major components,	2	6
Turbomachines and aerothermodynamics , aerothermal equations, Efficiencies, Dimensionless analysis, Performance	3	9
Centrifugal compressor concepts, Performance, Compressor surge – Axial flow compressor	3	9
Elementary airfoil theory, Laminar flow airfoil, Velocity triangle, degree of reactions Radial equilibrium, Diffusion factor, Performance characteristics	2	6

Radial-inflow turbines, Theory, Turbine design considerations, Performance characteristics – Axial flow turbines, turbine geometry, Reaction turbines Blades cooling concepts, Turbine aerodynamics –Performance computations.	3	9
pumps, characteristic curve of the pump, pump selection, cavitation.	2	6
Total	15	45

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30	9	3	3		45
	Actual	30	9	3	3		45
Credit	Planned	30	9	3	3		45
	Actual	30	9	3	3		45

3. Individual study/learning hours expected for students per week. **2**

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). Second, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. Third, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Figure out a comprehensive knowledge and critical understanding of the main subjects of the subject matter or specialization, including the main concepts, principles, theories and their current applications in the field of academic research specializing in mechanical engineering.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
1.2	Understand deeply one or more areas of specific specialization in relation to the latest theories, research and professional practice in mechanical		

	engineering.		
2.0	**Cognitive Skills**		
2.1	Apply continuously theoretical and practical knowledge in dealing with a variety of contexts, new and unexpected scientific, and provide authentic and innovative responses to problems and issues. Make convincing and informed judgments in situations where complete or consistent information is not available.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
2.3	Plan and execute large projects or part of scientific research independently, applying his theoretical and practical knowledge and using research methods to arrive at valuable conclusions that lead to important additions to current knowledge or professional practices.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Initiate the identification and creative handling of complex issues and problems in academic contexts. Act independently, when additional information or skills are needed, by searching for and applying the required information and skills.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*
3.2	Take fully responsibilities for his work, and cooperate fully and constructively with others when addressing issues and problems, demonstrating official and non-official leadership skills whenever necessary. Act in ways that always stimulate the effectiveness of the group as a whole in collective situations.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicates effectively and at an appropriate level with academic recipients and the community as a whole through formal and informal reports, presentations and academic publications, including the scientific letter or project report.	• *Lectures, tutorials, practical and independent study assignments.* • *Power point and video presentation on different topics.*	• *Classwork and Homework assignments.* • *Midterm.* • *Quizzes* • *Final exam*

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Quiz and Exercise	All along	10%
2	Report & Presentation	3-5	10%
3	Mid-term	7	20%
4	Final exam	16	60%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week) • ***Weekly office hours*** • ***Meetings and discussions on Blackboard***

E Learning Resources

1. List Required Textbooks • Turbomachinery: Basics, Theory and Applications, by E.Jr. Logan, John Wiley, 1993. • Compressors Performance: Selection, operation and testing of axial & centrifugal compressors, Theodore Gresh, Butterworth Heineman, 1990.
2. List Essential References Materials (Journals, Reports, etc.) *J. of Turbomachinery*
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. *www.asme.org & www.sciencedirect.com & www.springer.com*
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. According the class requirements

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) *Class room (with Data show & white board)* *Laboratory (Turbomachines lab.)*
2. Technology resources (AV, data show, Smart Board, software, etc.) *Data show*
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) *nothing*

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching *Questionnaire & Oral Discussion*
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *Upgrading the laboratories to attain updated equipment.* *Revising literature for new information.*
3. Procedures for Teaching Development • *Plan: The instructor will develop a strategy for teaching.* • *Do: The strategy will be implemented for one semester.* • *Study: The experiences of the students will be collected through a survey.* • *Act: Effective teaching strategies will be implemented and revised as more experiences are gained.*
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) *Analysis of questionnaires and exam results at Department Councils.*
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.

After each semester it will be taught, improvement process according to course report may be performed.

Name of Course Instructor:
Assoc. Prof. Mohamed Hassan Ahmed Mohamed

_____

Signature: _ Mohamed Hassan _ Date Completed: __18/10/2018_

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018/11/17

COURSE SPECIFICATIONS

Form

Course Title: Advanced Fluid Mechanics

Course Code: **804634**–3.....

This is according to the comments of reviewers 1 and 3. **:Commented [m@1]**

Date: 20.. Please fill here–.....–...	**Institution**: Umm Al-Qura University
College: . Please fill here	**Department**: Mechanical Engineering department

A. Course Identification and General Information

1. Course title and code: Advanced Fluid Mechanics, 804634-3

This according to the comments of reviewers 1 and 3 **:Commented [m@2]**

2. Credit hours: 3

3. Program(s) in which the course is offered. Please fill here

(If general elective available in many programs indicate this rather than list programs)

4. Name of faculty member responsible for the course Dr. Abdulmannan A. Saati

5. Level/year at which this course is offered: Fall 2019-2020

6. Pre-requisites for this course (if any):

7. Co-requisites for this course (if any):

8. Location if not on main campus: All sections are taught in the same location on the main campus

9. Mode of Instruction (mark all that apply):

a. Traditional classroom		percentage?	80
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	20
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course: To review fundamental concepts of fluid mechanics thoroughly and extend them in the first part of the course; to introduce advanced topics and solution techniques in the second part. To strengthen and unify the diligent student's background in fluid mechanics; and to prepare him/her to read the current literature in fluid mechanics and to pursue advanced studies in the subject.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Fluid properties. Basic laws for a control volume. Kinematics of fluid flow. Dynamics of frictionless incompressible flow and basic hydrodynamics. Equations of motion for viscous flow, viscous flow applications, boundary-layer theory. Wall turbulence, lift and drag of immersed bodies.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Fluid properties and other preliminary concepts	1	3
Basic laws for a control volume	2	6
Kinematics of fluid flow	1	3
Dynamics of frictionless and incompressible flow	1	3
Basic hydrodynamics and equations of motion of viscous flow	1	3
Exact solutions of viscous-flow equations and their applications	2	6
Boundary-layer theory	2	6
Lift and drag on immersed bodies	2	6
Incompressible turbulent flows and wall turbulence	2	6

2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42					42
	Actual	42					42
Credit	Planned	3					3
	Actual	3					3

3. Individual study/learning hours expected for students per week. 12

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Ability to define and look up fluid property	Please fill here	Please fill here
1.2	Ability to state basic laws for a control volume in different coordinate systems.	Please fill here	Please fill here
1.3	Ability to derive the kinematics of fluid flow in problem solving.	Please fill here	Please fill here
1.4	Ability to derive the equations for frictionless and incompressible flows.	Please fill here	Please fill here
1.5	Ability to derive the basic equations for motion of viscous flows.	Please fill here	Please fill here
1.6	Ability to find standard exact solutions of viscous flow equations	Please fill here	Please fill here
1.7	Ability to drive and solve some basic equations of boundary layer theory	Please fill here	Please fill here
1.8	Ability to find lift and drag forces on immersed bodies with simple shapes	Please fill here	Please fill here
1.9	Understand concepts of incompressible turbulent flows	Please fill here	Please fill here
2.0	**Cognitive Skills**		
2.1	Please fill here	Please fill here	Please fill here
2.2			
3.0	**Interpersonal Skills & Responsibility**		
3.1	Please fill here	Please fill here	Please fill here
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1			
4.2			
5.0	**Psychomotor(if any)**		
5.1			
5.2			

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Assignments		50%

2	Midterm project report.		20%
3	The final project report and discussions.		30%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

E Learning Resources

1. List Required Textbooks *Viscous Fluid Flow,* Frank M. White, Third Edition, McGraw Hill (2008)
2. List Essential References Materials (Journals, Reports, etc.) Incompressible Flow, 3rd edition, by R. L. Panton (2005) Boundary Layer Theory, 8th edition, by H. Schlichting & K. Gersten (2000). An Album of Fluid Motion, 12th edition, by M. Van Dyke (1982)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Please fill here
2. Technology resources (AV, data show, Smart Board, software, etc.) Please fill here
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Please fill here

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching There will be a number of assignments given throughout the course. There is a course project. There are no exams. The final grade will be based on marks obtained for the assignments and the course project. The composition of the grade: (1) 50% for the assignments and (2) 50% for the course project where 20% midterm project report and 30% for the final project report and discussions.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
3. Procedures for Teaching Development
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.

Name of Course Instructor: Dr. Abdulmannan A. Saati

Signature: _____ Date Completed: _____

Program Coordinator: Prof Mohamed Korrany

Signature: _____ Date Received: 2018/11/17