جامعة أم القرى

كلية الهندسة والعمارة الاسلامية

الماجستير في الهندسة الكهربائية بالمقررات

والمشروع البحثي

- **مسار الطاقة المتجددة**
- **مسار الشبكات الذكية**

4. Learning and Teaching

4/1 Learning Outcomes and Graduate Specifications

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

(a) Smart Grids

(b) Renewable Energy

4/1/2 Curriculum Study Plan Table

(a) Smart Grids Track

Level	Course Code	Course Title	Required or Elective	Prerequisite Courses	Credit Hours
Level 1	802603	Introduction to smart Grids	Required	Department Consent	3
	802604	Renewable Energy Technologies	Required	Department Consent	3
	802614	Optimization operation	Required	Department Consent	3
	802608	Digital Control Systems Analysis and Design	Required	Department Consent	3
	Total				12
Level 2	802618	Powerelectronics converters For Smart Grid	Required	Department Consent	3
	802619	ICT for Smart Grids and Smart Cities	Required	Department Consent	3
	802xx1	Elective S1.2.1	Elective	Department Consent	3
	802xx1	Elective S1.2.2	Elective	Department Consent	3
	Total				12
Level 3	802636	Advanced Digital Signal Processing	Required	Department Consent	3
	802637	Modelling and control of storage systems and associated converters	Required	Department Consent	3
	802xx1	Elective S1.3	Elective	Department Consent	3
	Total				9

Level 4	802698	ResearchProject	Required	Department Consent	3
	802640	Implementation ofSmart Gridscontrol algorithms	Required	Department Consent	3
	802xx1	Elective S1.4	Elective	Department Consent	3
	Total				9

Table 1 Core courses for Smart Grid Track

S.N	Course Code	Course Title	Prerequisite Courses	Credit Hours
1	802603	Introduction to smart Grids	Department Consent	3
2	802604	Renewable Energy Technologies	Department Consent	3
3	802614	Optimization Operation	Department Consent	3
4	802608	Control of Dynamic Systems	Department Consent	3
5	802636	Advanced Digital Signal Processing	Department Consent	3
6	802619	ICT for Smart Grids and Smart Cities	Department Consent	3
7	802618	Power electronics converters for smart Grid	Department Consent	3
8	802639	Modelling and control of storage systems and associated converters	Department Consent	3
9	802640	Implementation ofSmart grids controlalgorithms	Department Consent	3
10*	802698	Researchproject		3

Table 2 Elective courses S1.2 of Level 2 of Smart Grid

S.N	Course Code	Course Title	Prerequisite Courses	Credit Hours
1	802638	Communication networks in smart grid: an architectural view	Department Consent	3
2	802667	Photovoltaic Systems: Analysis, Operation, and Design	Department Consent	3
3	802669	Wind Energy Generation System	Department Consent	3
4	802670	Integration of Alternative Energy Sources	Department Consent	3

5	802668	Renewable Energy and Distributed Generation	Department Consent	3
6	802681	MicroprocessorandMicrocontroller	Department Consent	3

Table 3 Elective courses S1.3 of Level 3 of Smart Grid

S.N	Course Code	CourseTitle	Prerequisite Courses	Credit Hours
1	802682	Modelling and simulation of static converter	Department Consent	3
2	802683	Adaptive Protection systems in smart Grid	Department Consent	3
3	802684	IOT and Smart Grids Communication	Department Consent	3
4	802685	Modelling and operation of electrical grids	Department Consent	3
5	802686	Energy Management and Energy Efficiency of Buildings	Department Consent	3
6	802687	DC voltage transmissions and distribution in smart grids	Department Consent	3
7	802612	Data acquisition systems	Department Consent	3

Table 4 Elective courses S1.4 of Level 4 of Smart Grid

S.N	Course Code	CourseTitle	Prerequisite Courses	Credit Hours
1	802654	Satellite Communications	Department Consent	3
2	802656	Advanced Wireless Communication	Department Consent	3
3	802694	Advanced Topics in Communication Engineering	Department Consent	3
4	802643	Image Processing and Remote Sensing	Department Consent	3
5	802697	FACT's and power quality	Department Consent	3

4/1/2 Curriculum Study Plan Table

(b) Renewable Energy Track

Level	Course Code	Course Title	Required or Elective	Prerequisite Courses	Credit Hours
Level 1	802616	Energy and environment	Required	Department Consent	3
	802601	Advanced Numerical & Statistical Methods	Required	Department Consent	3
	802604	Renewable Energy technologies	Required	Department Consent	3
	802617	Renewable Energy and Power Generation	Required	Department Consent	3
	Total				12
Level 2	802635	Power electronics converters	Required	Department Consent	3
	802667	Photovoltaic Systems: Analysis, Operation, and Design	Required	Department Consent	3
	802XX2	Elective S2.1	Elective	Department Consent	3
	802XX2	Elective S2.2	Elective	Department Consent	3
	Total				12
Level 3	802669	Wind Energy Generation Systems	Required	Department Consent	3
	802639	Modelling and control of storage systems and associated converters	Elective	Department Consent	3
	802XX2	Elective S2.3	Elective	Department Consent	3
	Total				9
Level 4	802641	Renewable Energy Finance	Required	Department Consent	3
	802698	Research Project	Required	Department Consent	3
	802XX2	Elective S2.4	Elective	Department Consent	3
	Total				9

Table 5 The core courses for Renewable Energy Track

S.N	Course Code	Course Title	Prerequisite Courses	Credit Hours
1	802616	Energy and environment	Department Consent	3
2	802604	Renewable Energy Technologies	Department Consent	3
3	802601	Advanced Numerical & Statistical Methods	Department Consent	3
4	802617	Renewable Energy and Power Generation.	Department Consent	3
5	802635	Power electronics converters	Department Consent	3
6	802667	Photovoltaic Systems: Analysis, Operation, and Design	Department Consent	3
7	802669	Wind Energy Generation Systems	Department Consent	3
8	802639	Modelling and control of storage systems and associated converters	Department Consent	3
9	802641	Renewable Energy Finance	Department Consent	3
10*	802698	Research project		3

Table 6 Elective courses S2.2 of Level 2 of Renewable Energy

S.N	Course Code	Course Title	Prerequisite Courses	Credit Hours
1	802670	Integration of Alternative Energy Sources	Department Consent	3
2	802690	Solar Thermal Electricity	Department Consent	3
3	802691	Photovoltaic Solar Cell Physics and Technologies	Department Consent	3
4	802692	Electrical Machines and Drives for Renewable Energy systems	Department Consent	3

Table 7 Elective courses S2.3 of Level 3 of Renewable Energy

S.N	Course Code	Course Title	Prerequisite Courses	Credit Hours
1	802682	Modelling and simulation of static converters	Department Consent	3
2	802687	DC voltage Transmission and Distribution in Smart Grids	Department Consent	3
3	802686	Energy Management and Energy Efficiency of Buildings	Department Consent	3
4	802681	Microprocessor and microcontroller	Department Consent	3

Table 8 Elective courses S2.4 of Level 3 of Renewable Energy

S.N	Course Code	Course Title	Prerequisite Courses	Credit Hours
1	802675	Smart Grids in Power systems	Department Consent	3
2	802693	FACT's and power quality	Department Consent	3
3	802685	Modelling and operation of electrical grids	Department Consent	3
4	802696	Advanced Topics in Electrical Power Engineering	Department Consent	3

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):

a) Brief Description of Field Experience: **None**
b) Program Level (s) of Field Experience: **N/A**
c) Contact Hours of Field Experience and Time Table (Day / Week / Semester) **N/A**
d) Field Experience Credit Hours: **N/A**

Course Title: **Advanced Numerical and Statistical Methods**

Course Code: **802601**

1. Institution	Date
Umm Al-Qura University	**November 11, 2017 (Term-1, 1438/1439 AH: Fall 2017)**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: **ADVANCED NUMERICAL AND STATISTICAL METHODS (802601)**			
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) **ElectricalEngineering**			
4. Name of faculty member responsible for the course N/A			
5. Level/year at which this course is offered: **General compulsory course at first level.**			
6. Pre-requisites for this course (if any) **Department Consent**			
7. Co-requisites for this course (if any) **None**			
8. Location if not on main campus N/A			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	√	What percentage?	**100%**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

Comments: **It is a General Compulsory Course for all disciplines for both Thesis and Non-Thesis Tracks of MSc EE Program.**

B Objectives

1. The main purpose for this course: **To introduce students to the various concepts related to numerical and statistical analysis methods with emphasis on computer programming techniques used to implement these methods. The analysis will include dealing with numbers, solving equations, differential equations, error analysis.**
2. Plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field) **To improve this course, more emphasis and weight will be given to:** • **Using *MATLAB* and *Excel* based presentations to describe the concepts**

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **Numerical methods: Interpolation and approximation with polynomials, Least squares curve fitting, Solution of system of linear and nonlinear equations, Numerical integration and differentiation, Solution of ordinary and partial differential equations, Approximation by Spline functions, Use of computer techniques.** **Statistical methods: Random variables, estimation and detection, expectation and correlation, Bay's theorem, hypothesis testing, use of computer techniques in statistical analysis**

1. Topics to be Covered

Topics	No. of Weeks	Contact hours
Numerical methods: Interpolation and approximation with polynomials, Least squares curve fitting, Solution of system of linear and nonlinear equations	**4**	**12**
Numerical integration and differentiation, Solution of ordinary and partial differential equations, Approximation by Spline functions, Use of computer techniques.	**4**	**12**
Statistical methods: Random variables, estimation and detection, expectation and correlation, Baye's theorem, hypothesis testing, use of computer techniques in statistical analysis	**6**	**18**
Total	**14**	**42**

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

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact	**3**	-	-	-	-	**3**

Hours						
Credit	**3**	**-**	**-**	**-**	**-**	**3**

3. Additional private 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 Strategy

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Able to explain the concepts of numerical methods such as Interpolation and approximation with polynomials, Least squares curve fitting.**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-tern Exam, Final Exam**
1.2	**Able to explain the concepts of statistical methods such as Random variables, estimation and detection, expectation and correlation, Bay's theorem, hypothesis testing.**	**Traditional Lectures at a proficient level and *Excel* Presentations at an advanced level**	**HW Assignments, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	**Able to apply numerical methods to solve of system of linear and nonlinear equations.**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-Term Exam, Final Exam**
2.2	**Able to apply numerical methods to solve of ordinary and partial differential equations.**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-Term Exam, Final Exam**
2.3	**Able to develop variations of techniques in statistical analysis.**	**Traditional Lectures at a proficient level and *MATLAB/Excel* Presentations at an advanced level**	**HW Assignments, Mid-Term Exam, Final Exam**

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**HWASSIGNEMENTS**	**Bi-Weekly**	**10%**
2	**MID-TERMEXAM**	**10**	**30%**
3	**FINAL EXAM**	**16**	**60%**
	TOTAL		**100%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week) **Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.**

E Learning Resources

1. Required Textbooks **No required textbook**
2. Essential References Materials (Journals, Reports, etc.) **To be decide by the Faculty.**
3. Recommended Textbooks and Reference Material (Journals, Reports, etc) 1. **Mark Embree, "Numerical Analysis I", Rice University, 2012.** 2. **Jan Awrejcewicz, "Numerical Analysis: Theory and Applications", InTech, 2011.** 3. **Youssef Saad, "Numerical Methods for Large Eigenvalue Problems", SIAM, 2011.** 4. **Douglas W. Harder, Richard Khoury, "Numerical Analysis for Engineering", University of waterloo, 2010.** 5. **Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John-Wiley & Sons, 2006.** 6. **Roy D. Yates and David Goodman, "Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers", 2nd Edition, Wiley, 2004** 7. **Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists," fifth edition, Academic Press, 2014.**
4. Electronic Materials, Web Sites, Facebook, Twitter, etc. **None**
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **MATLAB student version (can be downloaded free of cost)**

F. Facilities Required

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 (3 Hours), Capacity = 20 Students**
2. Computing resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop may be provided.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or

attach list) **None**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **End of Term (Semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application Software data base for assessment and evaluation.**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department *** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** *** Final Exam question analysis**
3 Processes for Improvement of Teaching • **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** • **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan.** • **Pedagogical workshop may be conducted to improve teaching**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5 The planning arrangements for periodically reviewing course effectiveness and planning for improvement. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.**

Name of Instructor: **Dr. Mohammed S. Alshaikh**

Signature: _____ Date Report Completed: **11-11-2017**

Program Coordinator:_____

Signature: _____ Date Received: _____

Course Title: **Introduction to Smart Grids**

Course Code: **802603**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: Introduction to Smart Grid (8025603)			
2. Credit hours: 3			
3. Program(s) in which the course is offered. **ElectricalEngineering** (If general elective available in many programs indicate this rather than list programs)			
4. Name of faculty member responsible for the course : N/A			
5. Level/year at which this course is offered: ----------			
6. Pre-requisites for this course (if any): **Department Consent**			
7. Co-requisites for this course (if any):			
8. Location if not on main campus: N/A			
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 course offers the basic concepts of fundamentals, operation, design, analysis, and development of smart grid. Topics associated with smart grid will be covered, including smart grid economic dispatch, distributed energy resources including renewable generation, optimal power flow, wind/solar power output and forecasting, micro-grids, energy storage, electric vehicle and vehicle-to-grid, demand response and demand side management, advanced metering infrastructure, energy efficiency, and so on.

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) None

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

1. Topics to be Covered		
List of Topics	**No. of Weeks**	**Contact hours**
INTRODUCTION TO THE SMART GRID **Introduction to the smart grid, including objectives and functions, views of the smart grid within the industry, and design criteria.**	**1**	**3**
ELECTRICGRID **Overview of the electric grid, covering traditional grid components and new grid technologies, such as energy storage, distributed generation, and micro-grids.**	**2**	**6**
SMART GRID CONTROL ELEMENTS **Smart grid control elements required to monitor and control the grid, such as smart meters, sensors, and phasor measurement units**	**3**	**9**
COMMUNICATIONSANDINTEROPERABILITY **Communications and interoperability, including communications requirements, reliability, security, and technologies, from power-line communications to wireless.**	**2**	**6**
SMART GRID OPERATIONS AND ECONOMICS **Smart grid operations and economics, covering control and management functions, smart grid (ED), operations architectures (OPF), and information models.**	**2**	**6**
SMART GRID APPLICATIONS Smart grid applications, covering demand response and demand side management, advanced metering infrastructure, energy efficiency.	**3**	**9**
CHALLENGES AND SUMMAR **Smart grid challenges that need to be met, including research topics and implementation conside**rations.	**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	3					3
	Actual						
Credit	Planned	3					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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Introduction to the smart grid, including objectives and functions, views of the smart grid within the industry, and design criteria.	Traditional Lecture	**Quiz, Assignments ,Mid-tern Exam, Final Exam**
1.2	Overview of the electric grid, covering traditional grid components and new grid technologies, such as energy storage, distributed generation, and micro-grids.	Traditional Lecture	**Quiz, Assignments ,Mid-tern Exam, Final Exam**
1.3	Qualitative understanding of Smart grid control elements required to monitor and control the grid, such as smart meters, sensors, and phasor measurement units	Traditional Lecture	**Quiz, Assignments ,Mid-tern Exam, Final Exam**
1.4	Qualitative understanding of Communications and interoperability, including communications requirements, reliability, security, and technologies, from power-line communications to wireless.	Traditional Lecture	**Quiz, Assignments ,Mid-tern Exam, Final Exam**
1.5	Knowledge of Smart grid applications, covering demand response and demand side management, advanced metering infrastructure, energy efficiency.	Traditional Lecture	**Quiz, Assignments ,Mid-tern Exam, Final Exam**

2.0	**Cognitive Skills**		
2.1	Evaluating and making decisions on limited information	Traditional Lecture	**Quiz, Assignments ,Mid-Term Exam, Final Exam**
2.2	Importance of cross-discipline knowledge for meaningful contribution to the Smart Grid.	Traditional Lecture	**Quiz, Assignments ,Mid-Term Exam, Final Exam**
2.3	Forming an engineering argument.	Traditional Lecture	**Quiz, Assignments ,Mid-Term Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	Meet deadlines and work effectively in a research group.	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	Communication, Information Technology, Numerical		
4.1	Present research project and write a technical report	**Independent research at a proficient level**	**Presentation of Research Project.**

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**	**Proportionof Total Assessment**
1	Quiz	Bi-Weekly	10%
2	MID-TERM EXAM	8	20%
3	TERM PROJECT	12	20%
4	FINAL EXAM	16	50%
5	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks 1- Introduction to the Smart Grid: Concepts, Technologies and Evolution. 2- Smart Grid Standards: Specifications, Requirements, and Technologies. 3- Communication Networks for Smart Grids: Making Smart Grid Real. 4- Smart Grids and Sustainable Energy Systems: An Introduction. 5- Smart Grid Applications and Developments.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **Instructor's lecture notes and slides available on the Instructor's website** An introduction to smart grids - MyCourses https://intra.ece.ucr.edu/~hamed/Smart_Grid_Topic_2_Smart_Grid.pdf
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **HOMER, GAMS, Matlab student version**

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 (3 Hours), Capacity = 20 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **Non**

G Course Evaluation and Improvement Procedures

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

End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **1. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** **2. Final Exam question analysis**
3. Procedures for Teaching Development **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan**
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation**

Name of Course Instructor: Dr. Omar A. Hafez

Signature: _____ Date Completed: 25-10-2018
Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Renewable Energy Technologies**

Course Code: **802604**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: Renewable Energy Technologies (802604)
2. Credit hours: 3
3. Program(s) in which the course is offered. **ElectricalEngineering**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course : Prof. Anis Ammous
5. Level/year at which this course is offered: ----------
6. Pre-requisites for this course (if any): **Department Consent**
7. Co-requisites for this course (if any):
8. Location if not on main campus: N/A
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 course presents the various sources of renewable energy including wind, solar, water, geothermal and biomass as potential sources of energy and investigates the contribution they can make to the energy profile of the nation. The technology used to harness these resources will be presented. Discussions of economic, environment, politics and social policy are integral components of the course.

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)

None

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

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Energy picture and Resource understanding	**1**	**3**
Water Power (Hydro, Wave and Tidal)	**2**	**6**
Bioenergy:	**2**	**6**
Geothermal Energy	**2**	**6**
Solar thermal and PV	**3**	**9**
Wind engineering	**3**	**9**
Variability of power generation	**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	3					3
	Actual						
Credit	Planned	3					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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		

1.1	Form a good general view of the practicalities of harnessing renewable energy resources; of their rather diffuse nature; and of the possible environmental cost of utilising renewable energy, such as degrading visual amenity, alteration of water flows in rivers and estuaries, or other damage	Traditional Lecture	**HW Assignments ,Mid-tern Exam, Final Exam**
1.2	ability to model the loading and power of wind, wave and tidal energy systems	Traditional Lecture	**HW Assignments ,Mid-tern Exam, Final Exam**
1.3	Qualitative understanding of a range of factors which influence design of solar PV and bio-energy systems.	Traditional Lecture	**HW Assignments ,Mid-tern Exam, Final Exam**
1.4	Qualitative understanding of a range of factors which influence design of wind turbines, tidal stream turbines and wave energy devices.	Traditional Lecture	**HW Assignments ,Mid-tern Exam, Final Exam**
1.5	Knowledge of the effective solutions that can be applied to achieving both a low carbon and more secure energy infrastructure	Traditional Lecture	**HW Assignments ,Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	Evaluating and making decisions on limited information	Traditional Lecture	**HW Assignments ,Mid-Term Exam, Final Exam**
2.2	Importance of cross-discipline knowledge for meaningful contribution to the energy debate.	Traditional Lecture	**HW Assignments ,Mid-Term Exam, Final Exam**
2.3	Forming an engineering argument.	Traditional Lecture	**HW Assignments ,Mid-Term Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	Meet deadlines and work effectively in a research group.	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	Communication, Information Technology, Numerical		
4.1	Present research project and write a technical report	**Independent research at a proficient level**	**Presentation of**

			Research Project.

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**	**Proportionof Total Assessment**
1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	20%
4	FINAL EXAM	16	50%
5	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

2. List Required Textbooks

1/Alternative Energy Systems & Applications by B.K.Hodge, Wiley, 2010 ISBN 978-0-470-14250-9

2/Renewable Energy Technologies, edited by J.C.Sabonnadiere, Wiley, 2009,ISBN 978-1-84821-135-3

3/ Sustainable Energy Systems and Applications, Springer, 2011, 978-0-387-95860-6

4/ Tester, Drake, Driscoll, Golay, Peters. *SustainableEnergy:ChoosingAmongOptions;* MIT Press, 2005. The original text for this course

5/Schavemaker, van der Sluis. *ElectricPowerSystemsEssentials.* 2008. A good overview reference for electric power systems.

6/Keyhani, Ali. *Design of Smart Power Grid Renewable Energy Systems.* IEEE Press, 2011. Textbook for a senior-level EE course on smart grids and renewables with Matlab projects in each chapter. Good course project possibilities for EEs.

7/MacKay, David. *Sustainable Energy: Without the Hot Air;* UIT Cambridge, 2009. Simplified but comprehensive coverage of sustainable energy, aimed toward energy policy. (free download)

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

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

Instructor's lecture notes and slides available on the Instructor's website http://www.hydrosustainability.org/Hydropower-Sustainablility-Assessment Protocol.aspx http://www.prism-magazine.org/oct09/feature_01.cfm
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **Saber, Matlab student version**

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 (3 Hours), Capacity = 20 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **Non**

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **1. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** **2. Final Exam question analysis**
3. Procedures for Teaching Development **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in**

the form of result of analysis) to the faculty. **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan**
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation**

Name of Course Instructor: Prof. Anis AMMOUS___

Signature: _____ Date Completed: 25-10-2018_

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Digital Control Systems Analysis and Design**

Course Code: **802608**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: **DIGITAL CONTROL SYSTEMS ANALYSIS AND DESIGN [802608-3]**
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)
Electrical Engineering
4. Name of faculty member responsible for the course
N/A
5. Level/year at which this course is offered: **General elective course**
6. Pre-requisites for this course (if any): **Department Consent**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus: N/A
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	X	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
In this course, students will learn about typical digital control loops in a control system. Students will understand the concepts of sampling, aliasing and related phenomena in time and frequency domain. Students will learn how to use Z-transform to analyze discrete-time control loop. Students will learn how to analyze and synthesize digital control loops in time domain and in frequency domain. Student will be able to design state observer based controllers.

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 improve this course, more emphasis and weight will be given to:

- **Using *MATLAB* based presentations to describe the concepts.**

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

CourseDescription:

Digital control is used in most of the process controllers. This ourse introduces practical methods to analyse digital control loops. Various methods of discretization of continuous-time controllers are discussed. Time domain, frequency domain and state-space methods are studied. Digital control case studies will add further insight into the subject. After this course, students will hopefully be able to understand applied research in this area.

1. Topics to be Covered

List of Topics	No. of Weeks	Contacthours
Digital Control System Analysis	3	9
Discretization of continuous-time controllers	3	9
Digital Control methods in time-domain	2	6
Digital Control methods in frequency-domain	2	6
Digital Control methods in state-space	2	6
Digital Control case studies	2	6
Total	14	42

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	3
Credit	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Able to describe basic concepts of digital control analysis.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
1.2	**Able to explain discretization from time-domain.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
2.0	**Cognitive Skills**		
2.1	**Able to develop digital control systems in time-domain, frequency domain and state-space.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
2.2	**Able to analysis and design digital controllers for various process control applications.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Meet deadlines and work effectively in a research group.**	**Discussions in groups at a proficient level.**	**Presentations and Reports.**
4.0	**Communication, Information Technology, Numerical**		
4.1	**Present research project and write a technical report.**	**Independent research at a proficient level.**	**Presentation of Research Project.**

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	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	10%
4	FINAL EXAM	16	60%
	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks

No required textbook.

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

To be decide by the Faculty.

3. Recommended Textbooks and Reference Material (Journals, Reports, etc)

1. Astrom, K.J. and Wittenmark B., "Computer Controlled Systems: Theory and Design", Prentice-Hall, 3rd ed., 2011.

2. Leigh. J. R., "Applied Digital Control: Theory, Design and Implementation", Prentice-Hall, 2nd ed., 2006.

3. Franklin G. F., Powell J. W., and Workman M., "Digital Control of Dynamic Systems", Pearson Education; 3rd ed., 2005.

4. Ogata K., "Discrete-Time Control Systems", Prentice-Hall, 1995.

5. Phillips, C. L. And Nagle H. T. Jr., "Digital Control System Analysis and Design", Prentice-Hall, 3rd ed., 1994.

6. Math Works Inc., "Matlab User Guide, Control Systems Toolbox, and Signal Processing Toolbox", Latest edition.

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

None.

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

MATLAB student version (can be downloaded free of cost).

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 (3 Hours), Capacity = 20 Students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop may be provided.**
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 **End of Term (Semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application Software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** *** Final Exam question analysis**
3. Procedures for Teaching Development • **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** • **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvementplan.** • **Pedagogical workshop may be conducted to improve teaching.**
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is**

discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.

Name of Course Instructor: Dr. Mohammed S. Alshaikh

Signature: _____ Date Completed: 7-11-2017

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Data Acquisition Systems**

Course Code: **802612**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: **DATA ACQUISITION SYSTEMS (802612)**
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)
Electrical Engineering
4. Name of faculty member responsible for the course
N/A
5. Level/year at which this course is offered: **General elective course**
6. Pre-requisites for this course (if any): **Department Consent**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus: N/A
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	X	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 student will learn fundamentals of electronic collection of data from measurement devices and basics of electronic digital control of external equipment.

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 improve this course, more emphasis and weight will be given to:

- **Using *MATLAB* based presentations to describe the concepts.**
- **Using *LabVIEW* to demonstrate and develop data acquisition systems.**

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

CourseDescription:
Introduction to Data Acquisition and Control, Essentials of Computer Interfacing and Programming of Instruments, Developing Virtual Instruments in LabVIEW, Principles of Graphical Programming in LabVIEW, Basics of Measurement: Sensors and Transducers, Analog-to-Digital and Digital-to-Analog Conversion, Digital Input/Output, Timers and Counters, Fundamentals of Linear and Digital Control, Instrumentation Buses: Serial (RS232C, USB) and Parallel (GPIB) Elements of Data Analysis: Averaging, Filtering and Smoothing Data Analysis: Curve Fitting Wireless Sensor Networks, Advanced Signal Analysis: Correlation,FourierTransform.

1. Topics to be Covered

List of Topics	No. of Weeks	Contacthours
Introduction to Data Acquisition and Control	2	6
Computer Interfacing and Programming of InstrumentsLabVIEW	3	9
Basics of Measurement: Sensors and Transducers, Analog-to-DigitalandDigital-to-AnalogConversion, Digital Input/Output, Timers and Counters	3	9
Fundamentals of Linear and Digital Control	2	6
Instrumentation Buses (Serial and Parallel)	1	3
Data Analysis and Curve Fitting techniques	1	3
Wireless Sensor Networks and Advanced Signal Analysis	2	6
Total	14	42

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	3
Credit	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Able to describe basic concepts of data acquisition and fundamentals of linear and digital control.**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level. LabVIEW demonstration.**	**HW Assignments, Mid-term Exam, Final Exam.**
1.2	**Able to explain basics of measurement, interconnect busses.**	**Traditional Lectures at a proficient level and LabVIEW demonstration.**	**HW Assignments, Mid-term Exam, Final Exam.**
2.0	**Cognitive Skills**		
2.1	**Able to develop Virtual Instruments by Graphical Programming in LabVIEW.**	**Traditional Lectures at a proficient level and LabVIEW demonstration.**	**HW Assignments, Mid-term Exam, Final Exam.**
2.2	**Able to design a data acquisition system with appropriate measuring circuits, computer interface and connections, and signal analysis.**	**Traditional Lectures at a proficient level and *MATLAB Presentations at an advanced Level. LabVIEW demonstration***	**HW Assignments, Mid-term Exam, Final Exam.**
2.3	**Able to analyze data and produce fitted curves.**	**Traditional Lectures at a proficient level and *MATLAB***	**HW Assignments, Mid-term Exam, Final**

		Presentationsat an advanced Level.LabVIEW demonstration.	**Exam.**
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Meet deadlines and work effectively in a research group.**	**Discussionsin groups at a proficient level.**	**Presentations and Reports.**
4.0	**Communication, Information Technology, Numerical**		
4.1	**Present research project and write a technical report.**	**Independent research at a proficient level.**	**Presentation of Research Project.**

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	Proportionof Total Assessment
1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	10%
4	FINAL EXAM	16	60%
	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks

No required textbook.

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

To be decide by the Faculty.

3. Recommended Textbooks and Reference Material (Journals, Reports, etc)

1. Piromalis D., Tseles I.D., Systems Applications for Data Acquisition, Athens: Modern Publishing, (2012).

2. Tsele I.D., Aquisition and Data Processing, Athens: Modern Publishing,

(2002).
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **None.**
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **LabVIEW will be available in department laboratories.**

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 (3 Hours), Capacity = 20 Students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop may be provided.**
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 **End of Term (Semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application Software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** *** Final Exam question analysis**
3. Procedures for Teaching Development • **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** • **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvementplan.** • **Pedagogical workshop may be conducted to improve teaching.**

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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.**

Name of Course Instructor: Dr. Mohammed S. Alshaikh

Signature: _____ Date Completed: 7-11-2017

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Optimization Operation**

Course Code. **802614**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: Optimization in Operation **(802614)**
2. Credit hours: **3 (Theory: 3, Lab: 0)**
3. Program(s) in which the course is offered.
   - **MSc Electrical Engineering (Power Track)**
   - **MSc Electrical Engineering (Electronic and Communication Track)**
4. Name of faculty member responsible for the course
   - **Dr**. Omar Hafez
5. Level/year at which this course is offered: **4th Level/2nd Year**
6. Pre-requisites for this course (if any): **Department Consent**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	X	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
   1. Understand the Classification of Optimization Problems, Introduction to linear programming, Graphical Solutions
   2. Able to Solve Linear Programming Problems: Simplex Method
   3. Learn about Simplex Method in Matrix Form, Revised Simplex Method
   4. Sensitivity Analysis and Duality
   5. Be familiar with Nonlinear Programming and Multi-variable Optimization, Nonlinear Equations. Constrained Nonlinear Optimization, Lagrangian, Penalty and Barrier Methods
   6. Able to apply Optimization Using Quadratic Forms, Quadratic Programming, Discrete Optimization, Branch and Bound Methods
   7. Produce Applications: Portfolio Optimization, Optimization Toolbox.

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)

NIL

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

CourseDescription:

In this course the students will learn an introduction to linear programming, simplex method, duality theory and sensitivity analysis, formulating linear programming models, nonlinear optimization, unconstrained and constrained optimization, quadratic programming. Applications in financial modelling (investmentportfolioselection).

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to Optimization Problems in Grid	**1**	**3**
Linear Programming Problems, Simplex Method	**1**	**3**
Simplex Method in Matrix form	**1**	**3**
Sensitivity Analysis and Duality	**3**	**9**
Nonlinear Programming and Multi-variable Optimization,NonlinearEquations	**2**	**6**
Constrained Nonlinear Optimization, Lagrangian, Penalty and Barrier Methods	**2**	**6**
Optimization Using Quadratic Forms, Quadratic Programming	**2**	**6**
Discrete Optimization, Branch and Bound Methods	**2**	**6**
Applications: Portfolio Optimization, Optimization Toolbox	**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**		**0**	**0**	**0**	**30**
	Actual						
Credit	Planned	**45**					**45**
	Actual						

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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Become aware of the basic principles of Optimization problems in smart grid.**	**Lectures, tutorial , exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**
1.2	**Be able to use optimization tools in modeling financial issues.**	**Lectures, tutorial , exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**
1.3	**Familiarity with linear programming, simplex methods, duality theory and sensitivitiy analysis.**	**Lectures, tutorial , exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**
1.4	**Learn how to formulate linear**	**Lectures, tutorial ,**	**Quizzes,**

	programming models, nonlinear optimization, un constrained optimization, and quadratic programming.	**exercises**	**Assignments, Midterm Exam,, Final Exam**
2.0	**Cognitive Skills**		
2.1	**Apply conceptual understanding of concepts, principles, theories of Big Data and cloud computing on gathered information to predict the solutions of modern smart grid systems.**	**exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**
2.2			
3.0	**Interpersonal Skills & Responsibility**		
3.1			
4.0	**Communication, Information Technology, Numerical**		
4.1	**Ability to investigate and identify the modern issues for smart grid system design and application**	**exercises**	**Project Report**
4.2	**Use of the most appropriate information and optimization technology in formulating optimized tools for specific information from smart grid system and apply them creatively for proposing their solutions**	**exercises**	**Project Report**
5.0	**Psychomotor(if any)**		
	NotApplicable		

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**	**Proportionof Total Assessment**
1	**ClassRoomParticipation** **ClassRoomParticipation**	**Each** **Each**	**5** **05**
2	**HW Assignments**	**Alternate**	**05**
3	**Quizzes**	**Every 4 weeks**	**10**
4	**Major Examination**	**6th**	**20**
5	**Term Reports**	**12th**	**10**

6	**Sub Totals**		**50**
7	**FinalExamination**	**17th**	**50**
8	**Total**		**100**

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)

- **Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice.**
- **The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.**

E Learning Resources

1. List Required Textbooks

- **Introduction to Operations Research, by Frederick S. Hillier and Gerald J. Lieberman, McGraw Hill, 10th ed., 2015.**
- **Optimization in Operations Research, by Ronald L. Rardin, Pearson, 2017 or 1998.**

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

- **http://www.electricity.doe.gov/documents/**
- **Unites States NIST (National Institute of Standards and Technology) Framework and Roadmap for Smart Grid Interoperability Standards. Availableonline:http://www.nist.gov/smartgrid/**

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
See my website

- uqu.edu.sa/amnoorwali

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

- **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.)

- **Classroom, (2 Hours, 1 Hour), Capacity = 30 Students**

2. Technology resources (AV, data show, Smart Board, software, etc.) • **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **NIL**

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching • **End of Term (semester) confidential Student Feedback surveys are collected for each course.** • **Data is entered into an access data base developed by a faculty for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • **Assessment of course teaching strategies by corresponding department sequence committee.**
3. Procedures for Teaching Development • **Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** • **Final Exam question analysis**
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) **Comparison of standards of achievement is not done.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is**

made for changes after the approval of Faculty Council and sent to college council for approvalandimplementation.

Name of Course Instructor:

Dr. Omar Hafez

Signature: _____ Date Completed: 25-10-2018__

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Energy and Environment**

Course Code: **802616**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: **Energy and Environment (802616)**			
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)			
4. Name of faculty member responsible for the course Prof. Anis AMMOUS			
5. Level/year at which this course is offered:			
6. Pre-requisites for this course (if any): **Department Consent**			
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 course covers environmental impact of energy production and consumption. Further aspects studied are energy, energy efficiency, consumption patterns and sustainability. The course also includes an essay writing in which the student will get a closer knowledge of different forms of energy consumption.

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)

None

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

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introductions/energy basics	2	6
Energy system model	2	6
Representing an energy system	1	3
Forms, Use and Demand Analysis	3	9
Transformation Analysis	2	6
Resource Analysis	2	6
Cost-Benefit analysis	1	3
Energy perspectives for the next 100 years	1	3
Total	14	42

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3					3
	Actual						
Credit	Planned	3					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.)

CurriculumMap

Code	NQF Learning Domains	Course Teaching	Course

#	And Course Learning Outcomes	Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	describe basic energy concepts	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.2	account for conventional and renewable energy technologies and their application	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.3	reflect and evaluate the environmental impact of energy production and the relationship between energy production, consumption and climate change	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.4	reflect on energy costs	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
	analyse the consequences of today's energy consumption	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	demonstrate an ability to integrate knowledge and to analyse, assess and deal with complex phenomena, issues and situations, even when limited information is available;	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.2	Importance of cross-discipline knowledge for meaningful contribution to the energy debate.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.3	-use basic knowledge about different forms of production, transport and use of electricity and heating /cooling to solve simple problemes, and to use the knowledge to explain the relationship between the use of energy resources and environmental impacts.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	Meet deadlines and work effectively in a research group.	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	**Communication, Information Technology, Numerical**		
4.1	Present research project and write a technical report	**Independent research at a**	**Presentation of Research**

		proficient level	**Project.**

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**	**Proportionof Total Assessment**
1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	20%
4	FINAL EXAM	16	50%
5	TOTAL		100%

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

1/Energy systems and sustainability : power for a sustainable future . ed.: Oxford: Oxford University Press, 2012

2/J.B. Fenn, "Engines, Energy, and Entropy" (W.H. Freeman and Co., 1982)

3/Energy, Its Use and the Environment , 4th Edition by Hinrichs and Kleinbach

4/**Energy: Physical, Environmental, and Social Impact – 3rd Edition** , Gordon J. Aubrecht
Pearson/Addison-Wesley Publishers (2006)

5/**Energy & the Environment, 2nd Ed. By Ristinen and Kraushaar**

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

http://books.nap.edu/openbook.php?record_id=12450&page=R1
https://doi.org/10.2200/S00247ED1V01Y201001ETS011)
http://search.nap.edu/napcgi/de.cgi?term=%E2%80%9CNew+Science+for+a+Secure+and+Sustainable+Energy+Future%E2%80%9D&GO.x=27&GO.y=11

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 (3 Hours), Capacity = 20 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Non

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **1. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** **2. Final Exam question analysis**
3. Procedures for Teaching Development **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan**
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation**

Name of Course Instructor: _ Prof. Anis AMMOUS_____

Signature: _____ Date Completed: 25-10-2018

Program Coordinator:_____

Signature: _____ Date Received: _____

Course Title: **Power electronics converters for smart grids**

Course Code: **802618**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: Power electronics converters (802618)			
2. Credit hours: 3			
3. Program(s) in which the course is offered. **ElectricalEngineering** (If general elective available in many programs indicate this rather than list programs)			
4. Name of faculty member responsible for the course : N/A			
5. Level/year at which this course is offered: ----------			
6. Pre-requisites for this course (if any): **Department Consent**			
7. Co-requisites for this course (if any):			
8. Location if not on main campus: N/A			
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
   In this course, the student should be able to identify different power converter topologies and to understand and apply the specific and particular design and control techniques involved in the operation of power converters.

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)
None

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

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Power semiconductors and Thermal calculation	2	6
DC – DC Converters (Non isolated Converters) for smart Grids	2	6
Isolated Converters for smart grids	3	9
Control of DC-DC Converter:	2	6
Resonant Converters:	2	6
DC/AC converters and their control	4	12
Total	15	45

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3					3
	Actual	3					3
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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	Knowledge		

1.1	Understand the performance of basic converters for CCM and DCM operation	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.2	Understand the performance of resonant converters.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.3	Understand the dynamic response of converter using state space averaging and design controller.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.4	Understand the performance of DC/AC converters and their control	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	Carry out the performance analysis of derived converters	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
2.2	Design of magnetic component for converters.	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	Meet deadlines and work effectively in a research group.	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	Communication, Information Technology, Numerical		
4.1	Present research project and write a technical report	**Independent research at a proficient level**	**Presentation of Research Project.**

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	Proportionof Total Assessment
1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	20%
4	FINAL EXAM	16	50%
5	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

3. List Required Textbooks

1. Daniel W Hart, "Power Electronics", Tata McGraw Hill, 2011.
2. Rashid M.H., "Power Electronics – Circuits, Devices and Applications", 3rd Edition, Pearson, 2011.
3. D M Mitchel, "DC-DC Switching Regulator Analysis" McGraw-Hill Ltd, 1988.
4. Umanand L and Bhatt S R, "Design of Magnetic Components for Switched Mode Power Converters", New Age International, New Delhi, 2001
5. Ned Mohan, Tore M. Undeland, William P. Robbins, "Power Electronics Converters, Applications, and Design", 3rd Edition, Wiley India Pvt. Ltd, 2010.
6. Control of Power Inverters in Renewable Energ… (Hardcover)
by Qing-Chang Zhong, Tomas Hornik. Willey, 2013
7. Smart Grid: Technology and Applications
Janaka B. Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama
ISBN: 978-1-119-96909-9. Willey , Feb 2012
8. Grid Converters for Photovoltaic and Wind Power Systems
by Remus Teodorescu (Author), Marco Liserre (Author), Pedro Rodriguez (Author)
Wiley-IEEE Press; 1 edition (February 21, 2011)

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

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

Instructor's lecture notes and slides available on the Instructor's website

- http://www.eia.gov/energy_in_brief/article/power_grid.cfm
- http://www.eia.gov/tools/faqs/faq.cfm?id=108&t=3
- http://www.eia.gov/energy_in_brief/article/renewable_electricity.cfm
- http://www.eia.gov/survey/meetings/elec-prelim0612/pdf/ee_demandresponse_smartgrid_conchanges.pdf
- http://www.eia.gov/conference/2010/session8/grant.pdf
- http://www.eia.gov/analysis/studies/electricity/pdf/intl_sg.pdf
- http://www.eia.gov/conference/2010/session8/valocchi.pdf
- http://www.eia.gov/todayinenergy/index.cfm?tg=%20smart%20grid
- http://www.smartgridnews.com/artman/publish/Technologies_DG_Renewables/

What-to-do-when-you-have-TOO-MUCH-solar-power-think-inverters-6558.html#.U41AoXJdWSo ➢ http://www.outbackpower.com/applications/residential/grid-interactive
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **Saber, Pspice, Proteus, Matlab student version**

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 (3 Hours), Capacity = 20 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **Non**

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **1. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** **2. Final Exam question analysis**
3. Procedures for Teaching Development **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan**

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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation**

Name of Course Instructor: Prof. Anis AMMOUS___

Signature: _____ Date Completed: 25-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **ICT for Smart Grids and Smart Cities**.

Course Code. **802619**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: **ICT for Smart Grids and Smart Cities (802619)**
2. Credit hours: **3 (Theory: 3, Lab: 0)**
3. Program(s) in which the course is offered.
   - **MSc Electrical Engineering (Power Track)**
   - **MSc Electrical Engineering (Electronic Track)**
4. Name of faculty member responsible for the course
   - **Dr. Syed Abdul Moiz**
   - **Dr. Abdulfattah Noorwali**.
5. Level/year at which this course is offered: **4th Level/2nd Year**
6. Pre-requisites for this course (if any): **Department Consent**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	X	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 objective of this course is to

1. Demonstrate a high level of qualitative and quantitative understanding of smart grids for smart cities from a physical and economic perspective.

2. Describe in detail how big data is helpful to improve the reliability, efficiency, security, and safety of the smart grids as well as smart cities.

3. Learn the application of cloud computing for smart grids and smart cities operations for fast growth of information and proactive management.

4. Understand in detail the integration of Supervisory Control and Data Acquisition (SCADA) systems to allow remotely monitoring and controlling the smart grid for smart city.

5. Describe in detail the IEC 61850 international standard for defining communication protocols for intelligent electronic devices commonly used for smart grid system and other smart city operations.

6. Understand the cyber-security tools helps to manage smart grid and other smart city operations safely and securely.

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)

NIL

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

CourseDescription:

In this course the students will learn the fundamental skills required to design and control the smart distribution of electrical energy and intercommunication of subsystems through modern information technology trends such as big data, cloud processing, SCADA, cyber-security and IEC 61850 standard that support the development of smart grid and smart city.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to Smart Grid for Smart City	**2**	**6**
Application of Big Data	**3**	**9**
CloudComputing	**3**	**9**
SCADASystem	**3**	**9**

IEC 61850 Standard	**2**	**6**
Cyber-Security	**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**		**0**	**0**	**0**	**30**
	Actual						
Credit	Planned	**45**					**45**
	Actual						

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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Become aware of the basic principles of smart grids for smart cities**	**Lectures, tutorial , exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**
1.2	**Be able to follow big data and cloud computing concept with the help of SCADA for gathering, interpreting and communicating information**	**Lectures, tutorial , exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**

1.3	**Familiarity with the IEC 61850 stanadard for defining communication protocols for smart grid system and other smart cityoperations.**	**Lectures, tutorial , exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**
1.4	**Learn systematic knowledge of cyber-security to manage smart grid and other smart city operations safely and securely.**	**Lectures, tutorial , exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**
2.0	**Cognitive Skills**		
2.1	**Apply conceptual understanding of concepts, principles, theories of Big Data and cloud computing on gathered information to predict the solutions of modern smart grid systems.**	**exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**
2.2			
3.0	**Interpersonal Skills & Responsibility**		
3.1			
4.0	**Communication, Information Technology, Numerical**		
4.1	**Ability to investigate and identify the modern issues for smart grid system design and application**	**exercises**	**ProjectReport**
4.2	**Use of the most appropriate informationandcommunications technologyingathering, interpreting,andcommunicating information from smartgrid system and apply them creatively for proposing their solutions**	**exercises**	**ProjectReport**
5.0	**Psychomotor(if any)**		
	NotApplicable		

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**	**Proportionof Total Assessment**
1	**Class Room Participation** **Class Room Participation**	**Each** **Each**	**5** **05**
2	**HW Assignments**	**Alternate**	**05**
3			

	Quizzes	**Every 4 weeks**	**10**
4	**Major Examination**	**6th**	**20**
5	**Term Reports**	**12th**	**10**
6	**Sub Totals**		**50**
7	**FinalExamination**	**17th**	**50**
8	**Total**		**100**

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)

- **Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice.**
- **The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.**

E Learning Resources

2. List Required Textbooks

- **Momoh, James, " A. Smart grid: fundamentals of design and analysis". Vol. 63. John Wiley & Sons, 2012.**
- **Sudip Misra and Samaresh Bera, "Smart Grid Technology: A Cloud Computing and Data Management Approach", Cambridge University Press , November 8, 2018.**

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

- **http://www.electricity.doe.gov/documents/**
- **http://grouper.ieee.org/groups/scc21/**
- **http://grouper.ieee.org/groups/scc21/dr_shared/**
- **Unites States NIST (National Institute of Standards and Technology) Framework and Roadmap for Smart Grid Interoperability Standards. Availableonline:http://www.nist.gov/smartgrid/**
- **IEC 61850 Standard for Substation Automation. Available: http://www.iec.ch/**
- **IEEE Std C37.118-2011 (part 1 and 2) for Synchrophasors in Power Systems**
- **IEEE Std. 2030-2011 on Interoperability**

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
See my website

- h**ttp://syed-abdul-moiz.hpage.com/**

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

- **IEC 61850**

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 Hours, 1 Hour), Capacity = 30 Students**

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

- **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**

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

NIL

G Course Evaluation and Improvement Procedures

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

- **End of Term (semester) confidential Student Feedback surveys are collected for each course.**
- **Data is entered into an access data base developed by a faculty for assessment and evaluation.**

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • **Assessment of course teaching strategies by corresponding department sequencecommittee.**
3. Procedures for Teaching Development • **Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** • **Final Exam question analysis**
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) **Comparison of standards of achievement is not done.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.**

Name of Course Instructor: Dr. Syed Abdul Moiz
Dr. Abdulfattah Noorwali

Signature: _____ Date Completed: 25-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Power electronics converters**

Course Code: **802635**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: Power electronics converters (802635)			
2. Credit hours: 3			
3. Program(s) in which the course is offered. **ElectricalEngineering** (If general elective available in many programs indicate this rather than list programs)			
4. Name of faculty member responsible for the course : N/A			
5. Level/year at which this course is offered: ----------			
6. Pre-requisites for this course (if any): **Department Consent**			
7. Co-requisites for this course (if any):			
8. Location if not on main campus: N/A			
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
   In this course, the student should be able to identify different power converter topologies and to understand and apply the specific and particular design and control techniques involved in the operation of power converters.

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)
None

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

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Power semiconductors and Thermal calculation	2	6
DC – DC Converters (Non isolated Converters)	2	6
Isolated Converters:	3	9
Control of DC-DC Converters:	2	6
Resonant Converters:	2	6
DC/AC converters and their control	4	12
Total	**15**	**45**

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3					3
	Actual						
Credit	Planned	3					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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Understand the performance of basic converters for CCM and DCM operation	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**

1.2	Understand the performance of resonant converters.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.3	Understand the dynamic response of converter using state space averaging and design controller.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.4	Understand the performance of DC/AC converters and their control	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	Carry out the performance analysis of derived converters	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
2.2	Design of magnetic component for converters.	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	Meet deadlines and work effectively in a research group.	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	Communication, Information Technology, Numerical		
4.1	Present research project and write a technical report	**Independent research at a proficient level**	**Presentation of Research Project.**

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	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	20%
4	FINAL EXAM	16	50%
5	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

4. List Required Textbooks

1. Daniel W Hart, "Power Electronics", Tata McGraw Hill, 2011.
2. Rashid M.H., "Power Electronics – Circuits, Devices and Applications", 3rd Edition, Pearson, 2011.
3. D M Mitchel, "DC-DC Switching Regulator Analysis" McGraw-Hill Ltd, 1988.
4. Umanand L and Bhatt S R, "Design of Magnetic Components for Switched Mode Power Converters", New Age International, New Delhi, 2001
5. Ned Mohan, Tore M. Undeland, William P. Robbins, "Power Electronics Converters, Applications, and Design", 3rd Edition, Wiley India Pvt. Ltd, 2010.
6. Control of Power Inverters in Renewable Energ... (Hardcover)
by Qing-Chang Zhong, Tomas Hornik. Willey, 2013
7. Smart Grid: Technology and Applications
Janaka B. Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama
ISBN: 978-1-119-96909-9. Willey , Feb 2012
8. Grid Converters for Photovoltaic and Wind Power Systems
by Remus Teodorescu (Author), Marco Liserre (Author), Pedro Rodriguez (Author)
Wiley-IEEE Press; 1 edition (February 21, 2011)

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

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

Instructor's lecture notes and slides available on the Instructor's website

- http://www.eia.gov/energy_in_brief/article/power_grid.cfm
- http://www.eia.gov/tools/faqs/faq.cfm?id=108&t=3
- http://www.eia.gov/energy_in_brief/article/renewable_electricity.cfm
- http://www.eia.gov/survey/meetings/elec-prelim0612/pdf/ee_demandresponse_smartgrid_conchanges.pdf
- http://www.eia.gov/conference/2010/session8/grant.pdf

- http://www.eia.gov/analysis/studies/electricity/pdf/intl_sg.pdf
- http://www.eia.gov/conference/2010/session8/valocchi.pdf
- http://www.eia.gov/todayinenergy/index.cfm?tg=%20smart%20grid
- http://www.smartgridnews.com/artman/publish/Technologies_DG_Renewables/What-to-do-when-you-have-TOO-MUCH-solar-power-think-inverters-6558.html#.U41AoXJdWSo
- http://www.outbackpower.com/applications/residential/grid-interactive

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

Saber, Pspice, Proteus, Matlab student version

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 (3 Hours), Capacity = 20 Students

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

Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided

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

Non

G Course Evaluation and Improvement Procedures

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

End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.

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

1. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.
2. Final Exam question analysis

3. Procedures for Teaching Development

EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.
Faculty writes Improvement Plan for each course he teaches, implement this plan in the next

semester and analyze the results to see the effect of improvement plan
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation**

Name of Course Instructor: Prof. Anis AMMOUS___

Signature: _____ Date Completed: 25-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Advanced Digital Signal Processing**

Course Code: **802636**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: Advanced Digital Signal Processing (802636)
2. Credit hours: 3.00
3. Program(s) in which the course is offered: Electrical Engineering
4. Name of faculty member responsible for the course
Dr. Abdulfattah Noorwali
5. Level/year at which this course is offered:
Third Semester
6. Pre-requisites for this course (if any):
Department Consent
7. Co-requisites for this course (if any):
NA
8. Location if not on main campus:
Main Campus of UQU, Alabdeyah, Electrical Engineering Department
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:
Equip the student with the advanced Signal Processing tool to analyze, optimize and manage the future smart power grid.

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 improve this course, more emphasis and weight will be given to MATLAB-based simulation will be used to enhance concept understating.

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

Course Description:
This course introduces the advanced signal processing techniques and computational intelligence to the students.
Additionally, detailed coverage will be offered in power signal estimation and decomposition, pattern recognition techniques, detection of the power system signal variations.
Hence, bridges the gap between DSP, electrical power and energy engineering systems

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to the future smart grid	2	6
Power Systems and Signal Processing	3	9
Discrete Transforms for smart grid	3	9
Spectral Estimation for smart grid	2	6
Pattern Recognition for smart grid	2	6
Wavelets for smart grid	2	6
Time-Varying Harmonic	2	6

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3.0					3.0
	Actual						
Credit	Planned	3.0					3.0
	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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Able to describe Discrete Transforms, Spectral Estimation, and Pattern Recognition concepts.**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-term Exam, Final Exam**
1.2	**Able to explain the concepts Wavelets Applied to Power Fluctuations, *Time-Varying Harmonic and Asymmetry Unbalances and Time-Frequency Signal Decomposition.***	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-term Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	**Abel to apply knowledge of the most relevant aspects of signal processing with emphasis on the most recent applications.**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-term Exam, Final Exam**
2.2	**Able to design a state-of-the-are signal processing techniques for smart grid applications.**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-term Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Meet deadlines and work effectively in a research group.**	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	**Communication, Information Technology, Numerical**		
4.1	**Present research project and write a technical report**	**Independent research at a proficient level**	**Presentation of Research Project.**
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	HW ASSIGNEMENTS	Bi-Weekly	10%

2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	10%
4	FINAL EXAM	16	60%
5	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks:

- Ribeiro, Paulo Fernando., et al. Power Systems Signal Processing. John Wiley & Sons, 2013.
- Lyons, Richard G. Understanding Digital Signal Processing. Prentice Hall, 2011.
- Proakis, John G., and Dimitris G. Manolakis. Digital Signal Processing: Principle, Algorithms, and Applications. Pearson Prentice Hall, 2007.

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

- Z. Uddin, N. Shah, A. Ahmad, W. Mehmood, and F. Alam, "Signal Processing Techniques in Smart Grids," Smart Grid as a Solution for Renewable and Efficient Energy Advances in Environmental Engineering and Green Technologies, pp. 273–297.
- Zahoor Uddin, Ayaz Ahmad, Aamir Qamar, and Muhammad Altaf. 2018. Recent advances of the signal processing techniques in future smart grids. Hum.-centric Comput. Inf. Sci. 8, 1, Article 126 (December 2018), 15 pages. DOI: https://doi.org/10.1186/s13673-018-0126-9

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

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

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 • Computer Lab
2. Technology resources (AV, data show, Smart Board, software, etc.) • Dara show • MATLAB software
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) NA

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.**
3. Procedures for Teaching Development • **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** • **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvementplan.** • **Pedagogical workshop may be conducted to improve teaching**
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)

Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.**

Name of Course Instructor: Dr. Abdulfattah Noorwali
Signature: _____ Date Completed: 25-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Communication networks in smart grid: an architectural view**

Course Code. **802638**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: Communication networks in smart grid: an architectural view **(802638)**
2. Credit hours: **3 (Theory: 3, Lab: 0)**
3. Program(s) in which the course is offered.
   - **MSc Electrical Engineering (Power Track)**
4. Name of faculty member responsible for the course
   - **Dr. Abdulfattah Noorwali**.
5. Level/year at which this course is offered: **4th Level/2nd Year**
6. Pre-requisites for this course (if any): **Department Consent**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	X	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 objective of this course is to

1. Demonstrate a high level of qualitative and quantitative understanding of communication networks in smart grids for smart cities from a physical and economicperspective.

2. Describe in detail how protocols employed in different layers in communication networks is helpful to improve the reliability, efficiency, security, and safety of the smart grids as well as smart cities.

3. Learn the communication smart grid components, design and evaluate the performanceofcommunicationnetworks.

4. Understand in detail the effects of physical channels and random events on the performanceofnetworks.

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)

NIL

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

CourseDescription:

In this course the students will learn the fundamental skills required to design and control the smart intercommunication infrastructure through modern information technology. Students will be familiar with interconnected networks, link types, link parameters, node characteristics, switching, routing, traffic theory, and able to evaluate the performance of the communication smart grid network.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to Communication architectures and models for smart grid	**2**	**6**
Communication networks layers: HAN, NAN, WAN of Smart grid characteristics and benefits	**3**	**9**
Smart grid conceptual architecture, and its communicationinfrastructuresandprotocols	**3**	**9**
Communication queuing theories in smart grids	**3**	**9**

Mathematical models to establish optimization tools	**2**	**6**
Performance evaluation: network efficiency	**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**		**0**	**0**	**0**	**30**
	Actual						
Credit	Planned	**45**					**45**
	Actual						

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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Become aware of the basic principles of smart grids communication infrastructure**	**Lectures, tutorial , exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**
1.2	**Be able to follow HAN communications with different smart devices using wireline technologies including power-line communication (PLC), or BACnet**	**Lectures, tutorial , exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**

	protocol, and wireless technologies (e.g., Wi-Fi and ZigBee). Student will learn about ZigBee technology which is an open-standard low-power wireless protocol and by far the most popular IEEE 802.15.4 networking standard that meets most of the criteria defined in the OpenHAN system requirement specification(SRS).		
1.3	**Familiarity with the NAN that consists of HAN with smart meters to provide secure and seamless control of different home appliances. Students also will get familiar with Data Aggregator Unit (DAU) that consists of a NAN gateway to interface with the HAN and also with the WAN. Finally, students will learn how the DAU communicates with the HAN gateway using network technologies such as PLC, ANSI C12 protocols, WiMAX, or ZigBee.**	**Lectures, tutorial , exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**
1.4	**Learn systematic knowledge of a bridge between NANs and HANs and the utility network. Students will get familiar with WAN that provides a backhaul for connecting the utility company to the customer premises. In this case, a backhaul can adopt a variety of technologies (e.g., Ethernet, cellular network, or broadband access) to transfer the information extracted from the NAN to the utility local offices. A WAN gateway is also will be covered which can use broadband connection (e.g., satellite) or possibly an IP-based network (e.g., MPLS and DNP3) to provide an access for the utility offices to collect the required data. Finally, information privacy and reliability are the major**	**Lectures, tutorial , exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**

	concerns for the customer, security and fault tolerance of these communication technologies are covered in this section as well.		
2.0	**Cognitive Skills**		
2.1	**Apply conceptual understanding of concepts, principles, theories of interconnected network that gathered information to predict the solutions of modern smart grid systems.**	**exercises**	**Quizzes, Assignments, Midterm Exam,, Final Exam**
2.2			
3.0	**Interpersonal Skills & Responsibility**		
3.1			
4.0	**Communication, Information Technology, Numerical**		
4.1	**Ability to investigate and identify the modern issues for smart grid system design and application**	**exercises**	**Project Report**
4.2	**Use of the most appropriate informationandcommunications technologyingathering, interpreting,andcommunicating information from smart grid system and apply them creatively for proposing their solutions**	**exercises**	**Project Report**
5.0	**Psychomotor(if any)**		
	NotApplicable		

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**	**Proportionof Total Assessment**
1	**ClassRoomParticipation**	**Each**	**5**
2	**HW Assignments**	**Alternate**	**5**
3	**Quizzes**	**Every 4 weeks**	**10**
4	**Major Exam**	**6th**	**20**
5	**Term Reports**	**12th**	**10**
6	**Sub Totals**		**50**
7	**Final Exam**	**17th**	**50**
8	**Total**		**100**

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)

- **Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice.**
- **The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.**

E Learning Resources

3. List Required Textbooks

- **Budka, Kemmeth C., Deshpande, Jayant G., Thottan, Marina " Communication Networks for Smart Grid". ISBN: 978-1-4471-6301-5. Springer-Verlag London, 2014.**
- **Noorwali, Abdulfattah, "Modelling and Analysis of Smart Grids for Critical Data Communication". Western University, 2017, Available: https://ir.lib.uwo.ca/etd/4440/**

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

- **http://www.electricity.doe.gov/documents/**
- **http://grouper.ieee.org/groups/scc21/**
- **http://grouper.ieee.org/groups/scc21/dr_shared/**
- **Unites States NIST (National Institute of Standards and Technology) Framework and Roadmap for Smart Grid Interoperability Standards. Availableonline:http://www.nist.gov/smartgrid/**
- **https://pdfs.semanticscholar.org/82a4/fcdd26e821a8cf48090e399be707b41c2ebf.pdf**

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
See my website

- **http://uqu.edu.sa/**

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

- **MATLAB, OPNET, NS2**

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 Hours, 1 Hour), Capacity = 30 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) • **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **NIL**

G Course Evaluation and Improvement Procedures

3. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching • **End of Term (semester) confidential Student Feedback surveys are collected for each course.** • **Data is entered into an access data base developed by a faculty for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • **Assessment of course teaching strategies by corresponding department sequence committee.**
3. Procedures for Teaching Development • **Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** • **Final Exam question analysis**
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) **Comparison of standards of achievement is not done.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.

The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.

Name of Course Instructor: Dr. Abdulfattah Noorwali

Signature: _____ Date Completed: 25-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Modelling and control of storage systems and associated converters**

Course Code: **802639**

Course Specifications

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. **Course title and code: Modelling and control of storage systems and associated converters (802639)**
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) **ElectricalEngineering**
4. Name of faculty member responsible for the course N/A
5. Level/year at which this course is offered: **DisciplineElective**
6. Pre-requisites for this course (if any): **Department Consent**
7. Co-requisites for this course (if any) **None**
8. Location if not on main campus N/A
9. Mode of Instruction (mark all that apply)

a. traditional classroom	√	What percentage?	**100%**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course? In the current push to convert to renewable sources of energy, many issues raised years ago on the economics and the difficulties of siting energy storage are once again being raised today. It includes the practicalities of energy storage, generation, and absorption of electrical power; the difficulties of intermittent generation; and the use of pumped and underground pumped hydroelectric energy storage. It highlights the storage of compressed air, battery energy, solar thermal, and natural gas sources of energy.
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field) **To improve this course, more emphasis and weight will be given to:** • **Using *MATLAB* based presentations to describe the concepts**

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: Applications of Energy Storage to Generation and Absorption of Electrical Power, Impacts of Intermittent Generation, Pumped Hydroelectric Energy Storage, Underground Pumped Hydroelectric Energy Storage, Compressed Air Energy Storage, Flywheel energy storage, electrochemical energy storage, capacitor bank storage, Solar Thermal Energy Storage, Natural Gas Storage and Consideration on the choice of a storage system.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Applications of energy storage to generation and absorption of electrical power	**4**	**12**
Pumped hydroelectric energy storage and natural gas storage	**2**	**6**
Compressed air energy storage, Flywheel energy storage and electrochemical energy storage	**3**	**9**
Solar Thermal Energy Storage and capacitor bank storage	**3**	**9**
Consideration on the choice of a storage system	**2**	**6**
Total	**14**	**42**

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

	Lecture	Tutorial	Laboratory	Practical	Other:	Total

			or Studio			
Contact Hours	**3**	-	-	-	-	**3**
Credit	**3**	-	-	-	-	**3**

3. Additional private study/learning hours expected for students per week. **Provide by the professor**	**3**

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

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

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Able to explain applications of energy storage to generation and absorption of Electrical Power**	**Traditional Lectures at a proficient level**	**HW Assignments, Mid-tern Exam**
1.2	**Able to discuss capacitor bank storage and solar thermal energy storage**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-tern Exam, Final Exam**
1.3	**Able to describe natural gas storage Flywheel energy storage and electrochemical energy storage**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-tern Exam, Final Exam**
1.4	**Able to explain compressed air energy storage**	**Traditional Lectures at a proficient level**	**HW Assignments, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	**Able to design solar thermal energy storage and capacitor bank storage**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-Term Exam, Final Exam**
2.2	**Able to choose of a storage system type.**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-Term Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Meet deadlines and work effectively in a research group.**	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	**Communication, Information Technology, Numerical**		
4.1	**Present research project and write a technical report**	**Independent research at a proficient level**	**Presentation of Research Project.**

5. Schedule of Assessment Tasks for Students During the Semester			
	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	10%
4	FINAL EXAM	16	60%
	TOTAL		100%

D. Student Academic Counseling and Support

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

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks

1. F. S. Barnes, Jonah G. Levine, " Large Energy Storage Systems Handbook", CRC Press Publishers, 2011.
2. Alfred Rufer, "Energy Storage: Systems and Components", CRC Press Publisher, 2017.
3. A. Ter Gazarian, "Energy Storage for Power Systems", Peter Pegegrinus Ltd., 1994

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

Decide by the Professor

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

Decide by the Professor

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

Non

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

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.) **Classroom (3 Hours), Capacity = 20 Students**
2. Computing resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **None**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department *** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** *** Final Exam question analysis**
3 Processes for Improvement of Teaching **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan.** **Pedagogical workshop may be conducted to improve teaching**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the**

approval of Faculty Council and sent to college council for approval and implementation.

Name of Instructor: Dr Gamal Sowilam

Signature: _____ Date of Completion: 25-10-2018

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received: _____

Course Title: **Implementation of Smart Grids control algorithms**

Course Code: **802640**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: **Implementation of Smart grids control algorithms** (802640)			
2. Credit hours: 3			
3. Program(s) in which the course is offered. **Electrical Engineering** (If general elective available in many programs indicate this rather than list programs)			
4. Name of faculty member responsible for the course : Prof. Anis AMMOUS			
5. Level/year at which this course is offered: ----------			
6. Pre-requisites for this course (if any): **Department Consent**			
7. Co-requisites for this course (if any):			
8. Location if not on main campus: N/A			
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
* knowledge about the techniques and advanced work methodologies related to the field of Smartgrids and the Distributed Generation, in particular from the point of view of their control
* Evaluate and validate models and controllers of different components of Smartgrids, through simulations, using different computer tools.
* Apply computer and telecommunications tools as support for control in Smartgrids and Distributed Generation
* understand and analyze technical documents, standards and scientific articles on the subject of the Master, as well as to apply them in the development of work and research related to the field of Smartgrids

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)
None

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

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Algorithm of electricity management from renewable energy	2	6
logic and priority of energy production	2	6
type of load profile	2	6
software development processes concepts	2	6
software system analysis and design	2	6
network transport protocol	1	3
Socket programming	1	3
Real-time networking, Devices and gateways for smart grid	2	6
Total	**14**	**42**

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3					3
	Actual						
Credit	Planned	3					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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	knowledge about the techniques and advanced work methodologies related to the field of Smartgrids	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.2	Know and apply the concepts and specifications of the Smartgrids and their basic dimensioning	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.3	Evaluate and validate models and controllers of different components of Smartgrids,	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.4	Apply computer and telecommunications tools as support for control in Smartgrids	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.5	understand and analyze technical documents, standards and scientific articles on the subject of the Master	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**

2.0	**Cognitive Skills**		
2.1	demonstrate an ability to integrate knowledge and to analyse, assess and deal with complex phenomena, issues and situations, even when limited information is available;	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
2.2	Importance of cross-discipline knowledge for meaningful contribution to the energy debate.	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
2.3	Demonstrate the skill required to participate in research and development work or to work in other advanced contexts.	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	Meet deadlines and work effectively in a research group.	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	Communication, Information Technology, Numerical		
4.1	Present research project and write a technical report	**Independent research at a proficient level**	**Presentation of Research Project.**

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**	**Proportionof Total Assessment**
1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	20%
4	FINAL EXAM	16	50%
5	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

5. List Required Textbooks

1/K. Arnold: ¿Embedded Controller Hardware Design¿, 2001. LLH Technology Publishing.

2/Jean-Pierre Deschamps, Gery J. A. Bioul, Gery, Gustavo D. Sutter: Synthesis of Arithmetic Circuits: FPGA, ASIC and Embedded Systems. March 2006. John Wiley & Sons.

3/Uwe Meyer-Baese, Digital Signal Processing with Field Programmable Gate Arrays (Signals and Communication Technology), Third Edition, Springer 2007.

4/Steve Kilts, Advanced FPGA Design: Architecture, Implementation, and Optimization. John Wiley and Sons, 2007.

5/Maya B. Gokhale, Paul S. Graham, Reconfigurable Computing: Accelerating Computation with Field-Programmable Gate Arrays. Springer 2005.

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

IEEE Transactions on Industrial Electronics

IEEE Transactions on Smart Grid

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

Instructor's lecture notes and slides available on the Instructor's website

http://technav.ieee.org/tag/3046/digital-control

http://en.wikibooks.org/wiki/Embedded_Control_Systems_Design

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

OpenDSS, PowerWorld Simulator, MATPOWER, GridSim

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 (3 Hours), Capacity = 20 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **Non**

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **1. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** **2. Final Exam question analysis**
3. Procedures for Teaching Development **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan**
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval**

of Faculty Council and sent to college council for approval and implementation

Name of Course Instructor: Prof. Anis AMMOUS___

Signature: _____ Date Completed: 25-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Renewable Energy Finance**

Course Code: **802641**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: Renewable Energy Finance (802641)			
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)			
4. Name of faculty member responsible for the course Prof. Anis AMMOUS			
5. Level/year at which this course is offered:			
6. Pre-requisites for this course (if any): **Department Consent**			
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

* Understand the parameters that influence the financial aspects and project design of renewable energy initiatives.
* The module is mainly aimed at sensitising participants to qualitative issues in renewable energy projects.
* Knowledge of regulatory tools and issues that professionals need for jobs in policy and planning, management and consulting
* Developing the analytical skills needed for problem solving and interpretation of technical, regulatory and policy concepts involving renewable energy generation.
* Understanding what barriers exist to renewable energy project

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) None

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

1. Topics to be Covered		
List of Topics	**No. of Weeks**	**Contact hours**
KSA Energy/Environmental Policy and Regulatory Agencies	2	6
Conventional energy resources and related Regulatory Processes	1	3
Transportation Fuels, Energy use and Siting policies	2	6
Economics of Energy Resources – How to price Renewables?	2	6
KSA investments in Renewables	2	6
Basic financial metrics such as IRR, NPV and DSCR	2	6
Economic justification and impact of renewable energy projects	2	6
Effect of sustainability drivers on the renewable energy business	1	3
Total	14	42

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

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Comprehend major legislation governing renewable technologies used in the power generation sector.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.2	Analyze and critique the economic and environmental impacts of different energy policy options involving renewable energy-based electricity generation.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.3	Calculate the costs and evaluate the processes required to develop renewable energy generation projects.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.4	Research and compose in-depth policy briefs and analyses on energy legislation and regulation.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
	Evaluate the feasibility of renewable energy projects within a framework of political, economic, social and technical considerations.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	demonstrate an ability to integrate knowledge and to analyse, assess and deal with complex phenomena, issues and situations, even when limited information is available;	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.2	Importance of cross-discipline knowledge for meaningful contribution to the energy debate.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final**

			Exam
2.3	-use basic knowledge about different forms of production, transport and use of electricity and heating /cooling to solve simple problemes, and to use the knowledge to explain the relationship between the use of energy resources and environmental impacts.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	Meet deadlines and work effectively in a research group.	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	**Communication, Information Technology, Numerical**		
4.1	Present research project and write a technical report	**Independent research at a proficient level**	**Presentation of Research Project.**

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	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	20%
4	FINAL EXAM	16	50%
5	TOTAL		100%

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

1/Simon, Christopher A. 2007. Alternative Energy: Political, Economic and Social Feasibility. Lanham, MD: Rowman and Littlefield.

2/Renewable Energy Finance **Powering the Future,** Charles W Donovan

3/Financing Renewable Energy Projects: A guide for development workers ,
Authors Jenniy Gregory, Semida Silveira, Anthony Derrick, Paul Cowley, Catherine Alinson and Oliver Parish

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

http://www.rff.org/RFF/Documents/RFF-IB-09-11.pdf http://www.un.org/en/development/desa/policy/publications/policy_briefs/policybrief24.pdf http://www.rhsupplies.org/fileadmin/user_upload/toolkit/B_Advocacy_for_RHS/Guidelines_for_Writing_a_Policy_Brief.pdf
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **Instructor's lecture notes and slides available on the Instructor's website**
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 (3 Hours), Capacity = 20 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Non

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **1. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** **2. Final Exam question analysis**
3. Procedures for Teaching Development **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan**

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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation**

Name of Course Instructor: _ Prof. Anis AMMOUS_____

Signature: _____ Date Completed: _____

Program Coordinator:_____

Signature: _____ Date Received: _____

Course Title: **Image Processing and Remote Sensing**

Course Code: **802643**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: **IMAGE PROCESSING AND REMOTE SENSING (802643)**
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)
Electrical Engineering
4. Name of faculty member responsible for the course
Dr. Waheed A. Younis
5. Level/year at which this course is offered: **Discipline Elective**
6. Pre-requisites for this course (if any): **Department Consent**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus: N/A
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	X	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 provide primarily graduate students with an introduction to modern remote sensing techniques. The course prepares the student to undertake research in remote sensing and related areas, as preparation for post-graduation professional activities in remote sensing, or as a means of further broadening one's background in the general field of image generation and processing. For students interested in image processing in general, it provides a look at the combined optimization of image design and image analysis, and an introduction to techniques applicable for scenes of high complexity.

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 improve this course, more emphasis and weight will be given to:

- **Using *MATLAB* based presentations to describe the concepts.**

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

CourseDescription:

Introduction to the concepts of remote sensing, image data (multispectral, hyperspectral, LIDAR (Light Radar), microwave, SAR (Synthetic Aperture Radar) etc.) generation and analysis. Basic principles of data acquisition and measurement in natural scenes. Fundamentals of multispectral and hyperspectral data analysis for complex scenes. Application of signal/image processing, statistical and computational pattern recognition/classification algorithms to these problems. Spatial image processing methods and algorithms as appropriate to land scene data. Remote sensing applications in Geographic Information Systems (GIS). Practice with analysis of actual aircraft and spacecraft data in a cross-disciplinary environment, utilizing software packages such as MULTISPEC, MATLAB, ERDAS IMAGINE, ENVI and ESRI.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction, generation and analysis of image data	2	6
Acquisition of image data	3	9
DSP and Pattern recognition fundamentals	3	9
Remote sensing and GIS	3	9
Analysis of aircraft and spacecraft data	3	9
Total	14	42

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	3
Credit	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Able to describe image data characteristics.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
1.2	**Able to describe different applications of remote sensing, GIS, uses of aircraft/spacecraft data.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
2.0	**Cognitive Skills**		
2.1	**Able to apply knowledge of DSP and pattern recognition algorithms.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
2.2	**Able to utilize different software packages to address these problems.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Meet deadlines and work effectively in a research group.**	**Discussions in groups at a proficient level.**	**Presentations and Reports.**
4.0	**Communication, Information Technology, Numerical**		
4.1	**Present research project and write a technical report.**	**Independent research at a proficient level.**	**Presentation of Research Project.**

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	**HW ASSIGNEMENTS**	**Bi-Weekly**	**10%**
2	**MID-TERM EXAM**	**8**	**30%**
3	**TERM PROJECT**	**12**	**10%**
4	**FINAL EXAM**	**16**	**50%**
	TOTAL		**100%**

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks

T. M. Lillesand, R. W. Kiefer and J. W. Chipman, John, "Remote Sensing and Image Interpretation", 4th Edition, Wiley and Sons, 2004.

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

None

3. Recommended Textbooks and Reference Material (Journals, Reports, etc)

1. D. Landgrebe, "Signal Theory Methods in Multispectral Remote Sensing", J. Wiley, 2003.

2. John A. Richards and Xiuping Jia, "Remote Sensing Digital Image Analysis: An Introduction", Springer-Verlag, 1999.

3 .Kanellopoulos, G. G. Wilkinson, J. Austin, "Neurocomputation in Remote Sensing Data Analysis", Springer-Verlag, 1997.

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

Instructor's lecture notes and slides available on the Instructor's website.

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

MATLAB student version (can be downloaded free of cost)

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 (3 Hours), Capacity = 20 Students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop may be provided.**
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 **End of Term (Semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application Software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** *** Final Exam question analysis**
3. Procedures for Teaching Development • **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** • **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvementplan.** • **Pedagogical workshop may be conducted to improve teaching.**
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.

The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.

Name of Course Instructor: Dr. Waheed A. Younis

Signature: _____ Date Completed: 7-11-2017

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Satellite Communications**

Course Code: **802654**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: **SATELLITECOMMUNICATIONS (802654)**
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)
ElectricalEngineering
4. Name of faculty member responsible for the course
Dr. Abdulfattah M. Noorwali
5. Level/year at which this course is offered: **DisciplineElective**
6. Pre-requisites for this course (if any): **Department Consent, Modern telecommunication systems and digital communication systems.**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus: N/A
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	X	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 introduce the student to the parameters of link budget, satellite communication
subsystem and orbits, radio frequency bands and antennas used in satellites.

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 improve this course, more emphasis and weight will be given to:

- **Using *MATLAB* based presentations to describe the concepts.**

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

CourseDescription:
Historic perspective, orbital mechanics and constellations, Propagation considerations. Function of communication satellites, parameters of link budget, communication satellite subsystems, orbits, antennas. Modulation and Multiplexing Techniques for Satellite Links. Interference issues and other obstacles, existing and proposed mobile satellite systems.

1. Topics to be Covered

List of Topics	No. of Weeks	Contacthours
What do satellites do? (Types of satellites, The satellite market), Different orbits for different missions, Advantages and disadvantages of satellite communications, and Frequency Allocations for satellite services Satellite frequencies (L, S, C, X, ku, ka, examples).	**1**	**3**
Orbit control and Launching Methods: Launch Vehicles and services (How are satellites placed into orbit), Keppler law, coverage area, Doppler effect, Tracking, telemetry and Command, Attitude control subsystem, Launching orbits (polar, inclined, equatorial, LEO, MEO, GEO), Power, and Thermal Control.	**2**	**6**
Microwave Link Budget: Link budget (system noise, uplink, downlink, effects of Rain), Crosslink, Interference.	**1**	**3**
Space Segment (BUS Configuration and subsystems): Transponder model, Payload, Bus, TT&C, Satellite Transponder, Station keeping and TT&C subsystem, and Space segment processing (frequencytranslation)	**2**	**6**
Earth station Segment: Earth station configuration, Tracking Telemetry & Command (TT&C) ground facility, FECC, Direct broadcasting satellites, Home TV systems, and LNB.	**2**	**6**
Satellite Antennas: Corrugated Horn antenna, Double reflector antennas, Multi-feed Offset Fed Parabolic Reflector, Shaped reflector for (multi-beam radiation), Phased arrays, and Earth footprints and power levels (EIRP).	**2**	**6**

Digital communication techniques: Modulation Techniques, FDMA (Power requirement of the transponder), TDMA (Network synchronization, closed loop timing), CDMA (DS, FH), and Error CorrectingCodes.	**2**	**6**
Seminars: Satellite Internet Based, Direct Broadcasting satellite services, Satellite mobile services, VSATs (very Small aperture satellites), Remote sensing satellites +Search and Rescue (SAR), 'GPS' Global positioning Satellite system, GMDSS, Search and Rescue (SAR) + NOAA, Small Satellites, Digital communications for satellites, and International Space Station (ISS).	**2**	**6**
Total	**14**	**42**

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

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

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods

1.0	**Knowledge**		
1.1	**Able to describe Orbital Aspects and Launching concepts.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
1.2	**Able to explain the concepts of Spacecraft Subsystems, Link Budgets, Modulation, Multiple Access & On-Board Processing, Coding, Frequency & Propagation Aspects, Earth Station Technology & VSATs, and Non- Geosynchronous Orbits (NGSO).**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
2.0	**Cognitive Skills**		
2.1	**Able to apply knowledge of the most relevant aspects of satellite communication with emphasis on the most recent applications and developments to be able to design a digital satellite link in detail.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
2.2	**Able to design a very small aperture terminals (VSATs): modeling and analysis of systems.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Meet deadlines and work effectively in a research group.**	**Discussions in groups at a proficient level.**	**Presentations and Reports.**
4.0	**Communication, Information Technology, Numerical**		
4.1	**Present research project and write a technical report.**	**Independent research at a proficient level.**	**Presentation of Research Project.**

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	Proportionof Total Assessment
1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	10%
4	FINAL EXAM	16	60%
	TOTAL		100%

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) **Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.**

E Learning Resources

1. List Required Textbooks **K.N. Raja Rao. Satellite Communication: Concepts and Applications, Prentice-Hall, 2013.**
2. List Essential References Materials (Journals, Reports, etc.) **None**
3. Recommended Textbooks and Reference Material (Journals, Reports, etc) **1. G. Maral, M. Bousquet, and Z. Sun. Satellite Communications Systems: Systems, Techniques and Technology, John Wiley, 2009.** **2. G.D. Gordon and W.L. Morgan. Principles of Communications Satellites, NY: John Wiley,** **1993.** **3. T. Pratt, C. Bostian, and J. Allnutt, Satellite Communications, John Wiley, 2003.**
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **Instructor's lecture notes and slides available on the Instructor's website.**
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **MATLAB student version (can be downloaded free of cost).**

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 (3 Hours), Capacity = 20 Students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop may be provided.**
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
End of Term (Semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application Software data base for assessment and evaluation.

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
*** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.**
*** Final Exam question analysis**

3. Procedures for Teaching Development

- **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.**
- **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvementplan.**
- **Pedagogical workshop may be conducted to improve teaching.**

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)
Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.
The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.

Name of Course Instructor: Dr. Abdulfattah M. Noorwali

Signature: _____ **Date Completed:** **7-11-2017**

Program Coordinator: _____

Signature: _____ **Date Received:** _____

Course Title: **Advanced Wireless Communications**

Course Code: **802656**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: **ADVANCEDWIRELESSCOMMUNICATIONS [802656]**
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)
ElectricalEngineering
4. Name of faculty member responsible for the course
Dr. Abdulfattah M. Noorwali
5. Level/year at which this course is offered: **DisciplineElective**
6. Pre-requisites for this course (if any): **Department Consent, Spread spectrum communication and modern telecommunication systems.**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus: N/A
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	X	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 introduce the students to some of the latest advances in wireless communications. To familiarize the students with the design of wireless systems employing advanced diversity techniques, including MIMO, STBC, and STTC. To familiarize the students with the concept of spatial multiplexing and the trade-off with diversity schemes. To provide an understanding of beamforming and cooperative communicationtechniques.

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 improve this course, more emphasis and weight will be given to:

- **Using *MATLAB* based presentations to describe the concepts.**

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

CourseDescription:
Advanced diversity techniques, multiple-input multiple-output (MIMO) systems, space-time block codes (STBC), space-time trellis codes (STTC), spatial multiplexing and Bell laboratories layered space-time (BLAST) systems, diversity-multiplexing tradeoff, beamforming, cooperative communications.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Diversity: Time diversity, Space diversity, Frequency diversity; diversity, interference averaging, interference management, successive interference cancellation, superposition modulation, etc.	3	9
Coding and decoding: expressions for error performance and capacity for various transmission schemes, space-time coding, MRC, OFDM, CDMA.	3	9
Equalization: the operation of example algorithms, the effects of varying parameter values within these (water-filling, channel inversion, MMSE, ZF).	3	9
Smart antennas techniques.	2	6
Multiuser detection and receiver designs.	3	9
Total	14	42

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	3
Credit	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Able to describe the theories of information in wireless channels, broadband techniques and their applications, and conduct analysis and design multiuser detection algorithms.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
1.2	**Able to explain the concepts of diversity, interference, superposition modulation, etc, used in transmission information in wireless mobile channels.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
2.0	**Cognitive Skills**		
2.1	**Able to apply the principles and technique to communicationsystems design or undertake further research (case study based on allocated power, spectrum and users, QoS).**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
2.2	**Able to analyze and think critically on advanced problems related to error coding technique mainly at physical layer.**	**Traditional Lectures at a proficient level and MATLAB Presentations at an advanced level.**	**HW Assignments, Mid-term Exam, Final Exam.**
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Meet deadlines and work effectively in a research group.**	**Discussions in groups at a proficient level.**	**Presentations and Reports.**
4.0	**Communication, Information Technology, Numerical**		
4.1	**Present research project and write a technical report.**	**Independent research at a proficient level.**	**Presentation of Research Project.**

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**	**Proportionof Total Assessment**

1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	10%
4	FINAL EXAM	16	60%
	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks

L. Hanzo, T. H. Liew, B. L. Yeap, R. Y. S. Tee, and S. X. Ng, Turbo Coding, Turbo Equalization and Space-Time Coding: EXIT-Chart-Aided Near-Capacity Designs for Wireless Channels, Wiley-IEEE Press, 2 edition 2011.

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

None

3. Recommended Textbooks and Reference Material (Journals, Reports, etc)

1. Biglieri, R. Calderbank, A. Constantinides, A. Goldsmith, A. Paulraj, and H.
2. Vincent Poor, MIMO Wireless Communications, Cambridge: Cambridge University
Press, 2010.
3. Paulraj, R. Nabar and D. Gore, Introduction to space-time wireless communications,
Cambridge: Cambridge University Press, 2008.
4. Tse and P. Viswanath, Fundamentals of Wireless Communication, Cambridge: Cambridge University Press, 2005.
A. Goldsmith, Wireless Communications, Cambridge: Cambridge University Press, 2005.
5. Vucetic and J. Yuan, Space-time coding, John Wiley and Sons, 2003.

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

Instructor's lecture notes and slides available on the Instructor's website.

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

MATLAB student version (can be downloaded free of cost).

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 (3 Hours), Capacity = 20 Students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop may be provided.**
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 **End of Term (Semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application Software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** *** Final Exam question analysis**
3. Procedures for Teaching Development • **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** • **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvementplan.** • **Pedagogical workshop may be conducted to improve teaching.**
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness

and planning for developing it.
The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.

Name of Course Instructor: Dr. Abdulfattah M. Noorwali

Signature: _____ Date Completed: 7-11-2017

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Photovoltaic Systems**: **Analysis**, **Operation and Design**

Course Code: **802667**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: **PHOTOVOLTAICSYSTEMS:ANALYSIS, OPERATION,ANDDESIGN [802667-3]**
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)
ElectricalEngineering-PowerEngineering
4. Name of faculty member responsible for the course
Prof. Anis A. Ammous
5. Level/year at which this course is offered: **DisciplineElective**
6. Pre-requisites for this course (if any): **Knowledge Based: Industrial Electronics, Circuit Analysis, Control, Electronic Devices**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus: N/A
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	x	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

PV systems utilize a variety of equipment, some of which is manufactured through sophisticated and complex technologies. This course aims to describe the components of PV systems and the basic principles to transform energy from sunlight to electricity. This will include systems that are tied to the utility grid as well as systems that stand alone or include storage backup with batteries. Keys for modern intelligent PV design are introduced. Loading and economic computation for application sites are 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)

None

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

CourseDescription:

PV Applications and electricity, Safety Basics, PV System Components, Efficient Appliances, Solar Site Analysis, PV System Wiring and Over current Protection, Stand-Alone PV System Sizing, Grid-Tie System Sizing, Component Specification, System Costs and Economics, Determining the energy requirements for any desired application and determining the capacity and specifications for each of the components. Finalizing system design and commissioning.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to Photovoltaic systems.	1	3
Solar Cells Characterization and technologies	1	3
Standalone PV systems and installation	2	6
Grid connected PV systems and installation	2	6
Managing energy efficiency	4	12
PV systems sizing	4	12
Total	14	42

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	3
Credit	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Describe the principle of PV cells**	**Traditional lecture at an advancedlevel**	**Mid Term Exam, Final Exam**
1.2	**Describe integration of PV sources into utility grid.**	**Traditional lecture at an advancedlevel**	**Mid Term Exam, Final Exam**
1.3	**Describe stand-alone PV systems**	**Traditional lecture at an advancedlevel**	**Mid Term Exam, Final Exam**
1.4	**Describe how sizing PV systems**	**Traditional lecture at an advancedlevel**	**Mid Term Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	**Write Fundamental equations of PV cells**	**Traditional lecture at an advancedlevel**	**Mid Term Exam, Final Exam**
2.2	**Design photovoltaic energy systems**	**Traditional**	**Mid Term**

	in ON-grid and Off-grid applications.	**lecture at an advancedlevel**	**Exam, Final Exam**
2.3	**Propose the accurate control strategyand dimensioning of a PV system for a given application**	**Traditional lecture at an advancedlevel**	**Mid Term Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Conduct bibliographic research and study of a given PV system**	**Term Paper and presentation at a proficient level**	**Term Paper Report**
3.2	**Propose the accurate system and control strategy of a PV system for a given application**	**Traditional lecture at an advancedlevel**	**Mid Term Exam, Final Exam**
4.0	**Communication, Information Technology, Numerical**		
4.1	**Communicate in written and analysis form**	**Term Paper and presentation at a proficient level**	**Written Report.**

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project,examination,speech,oralpresentation, etc.)	**Week Due**	**Proportionof Total Assessment**
1	MID-TERM EXAM	10	10%
2	Final Examination	16	70%
3	Mini Project	13	20%
	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks **Roger A. Messenger and Jerry Ventre, " Photovoltaic Systems Engineering", CRC Press, third Edition, 2010.**
2. List Essential References Materials (Journals, Reports, etc.) **None**
3. Recommended Textbooks and Reference Material (Journals, Reports, etc) **1. Transition to Renewable Energy Systems, by Detlef Stolten, Viktor Scherer** **2. ISBN: 978-3-527-33239-7** **3. Understanding Renewable Energy Systems, Volume 1, by Volker Quaschning , Earthscan, 2005** **4. Renewable energy: power for a sustainable future, by Godfrey Boyle, Oxford University Press in association with the Open University, 3 oct. 1996** **5. Microgrids and active distribution Networks : S. Chowdhury, S.P. Chowdhury and P. Crossley: ISBN 978-1-84919-014-** **6. A Field Guide to Renewable Energy Technologies, by Robert Ferry, Elizabeth Monoian - Society for Cultural Exchange , 2012.** **7. Heinrich Haeberlin, "Photovoltaics System Design and Practice ", Wiley, First edition, 2012.**
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **Instructor's notes are available on the university Website.**
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **None.**

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 (3 Hours), Capacity = 20 Students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop may be provided.**
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 **End of Term (Semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application Software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** *** Final Exam question analysis**
3. Procedures for Teaching Development • **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** • **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvementplan.** • **Pedagogical workshop may be conducted to improve teaching.**
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) **Comparison of standards of achievement is not done**.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.**

Name of Course Instructor: Prof. Anis Ammous

Signature: _____ Date Completed: 7-11-2017

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Renewable Energy and Distributed Generation**

Course Code: **802668**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: **RENEWABLE ENERGY AND DISTRIBUTED GENERATION [802668-3]**
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)
ElectricalEngineering
4. Name of faculty member responsible for the course
N/A
5. Level/year at which this course is offered: **DisciplineElective**
6. Pre-requisites for this course (if any): **Department Consent**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus: N/A
9. Mode of Instruction (mark all that apply):

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

Comments: **It is an Elective Course for the power discipline for both Thesis and Non- Thesis Tracks of MSc EE Program.**

B Objectives

1. The main objective of this course
To gives students a comprehensive understanding of distributed power generation system and renewable energy technologies. Students will learn practical applications in the field and examples using realistic data.

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 improve this course, more emphasis and weight will be given to:

- **Using *MATLAB* based presentations to describe the concepts.**

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

CourseDescription:

The course begins with an overview of the development of electric power industry, including an introduction to the technical side of power generation, distributed generation technologies, benefits of distributed generations, challenges with distributed generations, in depth coverage of renewable and alternative energy technologies such as solar, wind, biomass and hydro are provided. The course also discusses technical and economic analyses of renewable power system, while providing techniques for evaluating the efficiency and cost-effectiveness of the renewableenergytechnologies.

1. Topics to be Covered

List of Topics	No. of Weeks	Contacthours
Introduction to Distributed Generation, and DistributedGeneration Technologies.	2	6
Introduction to Renewable Energy	1	3
Wind Power in Power Systems.	2	6
Solar and Hydro.	2	6
Storage Devices and Some DGs applications	2	6
Economics of Distributed Generation	2	6
Power System Planning, Operation with DG, and DG Interconnection.	3	9
Total	14	42

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	3
Credit	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Offers the basic concepts of fundamentals, operation, design, analysis, and development of DGs**	**Traditional Lectures at a proficient level**	**Quiz, Small Project, Mid-tern Exam, Final Exam**
1.2	**Able to explain the optimal power flow of distributed energy resources including renewable generation in details.**	**Traditional Lectures at a proficient level and *softwareprograms* Presentations at an advanced level**	**Quiz, Small Project, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	**Able to apply knowledge of basic concepts of fundamentals, operation, design, analysis, and development of DGs and renewable generation in order to study the impact and integration on power system.**	**Traditional Lectures at a proficient level and *softwareprograms* Presentations at an advanced level**	**Quiz, Small Project, Mid-tern Exam, Final Exam**
2.2	**Able to solve and apply optimal power flow of distributed energy resources including renewable generation.**	**Traditional Lectures at a proficient level and *softwareprograms* Presentations at an advanced level**	**Quiz, Small Project, Mid-tern Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Meet deadlines and work effectively in a research group.**	**Discussions in groups at a proficient level.**	**Presentations and Reports.**
4.0	**Communication, Information Technology, Numerical**		
4.1	**Present research project and write a technical**	**Independent research**	**Presentation**

	report.	**at a proficient level.**	**of Research Project.**

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**	**Proportionof Total Assessment**
1	QUIZZES ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	10%
4	FINAL EXAM	16	60%
	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks

Gilbert M. Masters, "Renewable and Efficient Electric Power System", John Wiley and Sons, Inc, 2005.

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

O. Hafez, and K. Bhattacharya, "Optimal planning and design of a renewable energy based supply system for micro-grids," International Journal of Renewable Energy, Vol. 45, 2012, pp.7-15.

3. Recommended Textbooks and Reference Material (Journals, Reports, etc)

1. Bollen, Math H., Hassan and Fainan, "Integration of Distributed Generation in the Power System", Wiley – IEEE Press, 2011.
2. B. Sorensen, "Renewable Energy", Academic Press, Fourth Edition, 2010.

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

Instructor's lecture notes and slides available on the Instructor's website.

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

GAMS, HOMER, student version (can be downloaded free of cost)

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 (3 Hours), Capacity = 20 Students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop may be provided.**
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 **End of Term (Semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application Software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** *** Final Exam question analysis**
3. Procedures for Teaching Development • **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** • **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvementplan.** • **Pedagogical workshop may be conducted to improve teaching.**
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.

The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.

Name of Course Instructor: Dr. Omar A. Hafez

Signature: _____ Date Completed: 7-11-2017

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Wind Energy Generation Systems**

Course Code: **802669**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: **WINDENERGYGENERATIONSYSTEMS [802669-3]**
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)
ElectricalEngineering-PowerEngineering
4. Name of faculty member responsible for the course
Prof. Anis A. Ammous
5. Level/year at which this course is offered: **DisciplineElective**
6. Pre-requisites for this course (if any): **Power Electronics converters, electromechanical conversion systems, Electrical drives, control..**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus: N/A
9. Mode of Instruction (mark all that apply):

a. Traditional classroom	X	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 course is devoted to develop perspectives regarding the demand for wind power generation system technology and to evaluate the environmental and economic issues associated with wind energy applications.

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)

None

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

CourseDescription:

Introduces wind turbine systems, including wind energy potential and application to power generation. Topics include wind energy principles, wind turbine components, power generation machinery, control systems, connection to the electric grid and maintenance.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to wind systems.	1	3
Wind turbines principle and technologies	3	9
On grid wind systems and installation	3	9
Wind systems control	5	15
Wind farms topologies and Energy Managing	2	6
Total	14	42

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	3
Credit	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Describe the principle wind aero-generators**	**Traditional lecture at an advanced level**	**Mid Term Exam, Final Exam**
1.2	**Describe integration of wind sources into utility grid.**	**Traditional lecture at an advanced level**	**Mid Term Exam, Final Exam**
1.3	**Describe the different control strategies**	**Traditional lecture at an advanced level**	**Mid Term Exam, Final Exam**
1.4	**Describe wind farms topologies**	**Traditional lecture at an advanced level**	**Mid Term Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	**Write Fundamental equations of aero-generators**	**Traditional lecture at an advancedlevel**	**Mid Term Exam, Final Exam**
2.2	**Wind energy systems in ON-grid applications.**	**Traditional lecture at an advanced level**	**Mid Term Exam, Final Exam**
2.3	**Propose the accurate control strategy and dimensioning of a wind system for a given application**	**Traditional lecture at an advanced**	**Mid Term Exam, Final Exam**

		level	
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Conduct bibliographic research and study of a given wind system**	**Term Paper and presentation at a proficient level**	**Term Paper Report**
3.2	**Propose the accurate system and control strategy of a wind system for a given application**	**Traditional lecture at an advanced level**	**Mid Term Exam, Final Exam**
4.0	**Communication, Information Technology, Numerical**		
4.1	**Communicate in written and analysis form**	**Term Paper and presentation at a proficient level**	**Written Report.**

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	MID-TERM EXAM	10	10%
2	Final Examination	16	70%
3	Mini Project	13	20%
	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks **S. Heier, R. Waddington, "Grid Integration of Wind Energy Conversion System", John Wiley & Sons, 2006.**
2. List Essential References Materials (Journals, Reports, etc.) **None**
3. Recommended Textbooks and Reference Material (Journals, Reports, etc) **1. J. F. Maxwell, J. G. McGowan, and A. L. Rogers, Wind Energy Explained – Theory, Design, and Applications, John Wiley & Sons, 2009.** **2. S. M. Muyeen, "Wind Energy Conversion Systems: Technology and Trends", Springer, 2012** **3. Transition to Renewable Energy Systems, by Detlef Stolten, Viktor Scherer ISBN: 978-3-527-33239-7** **4. Understanding Renewable Energy Systems, Volume 1, by Volker Quaschning , Earthscan, 2005** **5. Renewable energy: power for a sustainable future, by Godfrey Boyle, Oxford** **University Press in association with the Open University, 3 oct. 1996** **6. Microgrids and active distribution Networks : S. Chowdhury, S.P. Chowdhury and P. Crossley: ISBN 978-1-84919-014-** **7. A Field Guide to Renewable Energy Technologies, by Robert Ferry, Elizabeth Monoian - Society for Cultural Exchange , 2012.**
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **Instructor's notes are available on the university Website.**
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **None.**

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 (3 Hours), Capacity = 20 Students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop may be provided.**
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

End of Term (Semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application Software data base for assessment and evaluation.

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

*** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.**
*** Final Exam question analysis**

3. Procedures for Teaching Development

- **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.**
- **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvementplan.**
- **Pedagogical workshop may be conducted to improve teaching.**

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)

Comparison of standards of achievement is not done.

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

The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.

Name of Course Instructor: Prof. Anis Ammous

Signature: _____ Date Completed: 7-11-2017

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Integration Of Alternative Energy Sources**

Course Code: **802670**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: **INTEGRATION OF ALTERNATIVE ENERGY SOURCES [802670-3]**
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)
ElectricalEngineering
4. Name of faculty member responsible for the course
Dr. **Mohamed S. Rezk**
5. Level/year at which this course is offered: **DisciplineElective**
6. Pre-requisites for this course (if any): **Department Consent**
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus: N/A
9. Mode of Instruction (mark all that apply):

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

Comments: **It is an Elective Course for the power discipline for both Thesis and Non- Thesis Tracks of MSc EE Program.**

B Objectives

1. The main objective of this course
The course aims to provide depth knowledge in integration and interconnection of renewable and alternative energy sources. Students will design renewable and alternative energy systems for specific applications.

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 improve this course, more emphasis and weight will be given to:

- **Using *ETAP Software* based presentations to describe the concepts.**

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

CourseDescription:

Emphasis will be placed on the energy flow, storage, power management hybridization, integration and interconnection of renewable and alternative energy sources. Various storage devices used incorporation with renewable and alternative energy systems are discussed and compared. The course will also cover the design and performance analysis of some applications of renewable energy systems in distributed generation, grid connected system and rural electrification.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Renewable and alternative energy sources	3	9
Storage devices used incorporation with renewable energy	2	6
Integration and interconnection of renewable and alternative energy sources	3	9
Applications of renewable energy in grid connected system and rural electrification.	3	9
Design and performance of some applications of renewable energy systems in distributed generation	3	9
Total	14	42

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	3
Credit	Planned	3	-	-	-	-	3
	Actual	3	-	-	-	-	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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Able to describe the renewable and alternativeenergysources**	**Traditional Lectures at a proficient level and *ETAP* Presentations at an advanced level**	**HW Assignments, Mid-tern Exam, Final Exam**
1.2	**Able to explain the integration and interconnection ofrenewable and alternativeenergysources.**	**Traditional Lectures at a proficient level and *ETAP* Presentations at an advanced level**	**HW Assignments, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	**Able to analyze the performance and applications of renewable energy in grid connected system and rural electrification.**	**Traditional Lectures at a proficient level and *ETAP* Presentations at an advanced level**	**HW Assignments, Mid-tern Exam, Final Exam**
2.2	**Able to design of some applications of renewable energy systems in distributedgeneration.**	**Traditional Lectures at a proficient level and *ETAP* Presentations at an advanced level**	**HW Assignments, Mid-tern Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Meet deadlines and work effectively in a research**	**Discussions in groups at a proficient level.**	**Presentations**

	group.		**and Reports.**
4.0	**Communication, Information Technology, Numerical**		
4.1	**Present research project and write a technical report.**	**Independent research at a proficient level.**	**Presentation of Research Project.**

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	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	20%
4	FINAL EXAM.	16	50%
	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks

F. A. Farret, M.G. Simoes, "Integration of Alternative Sources of Energy", Wiley Interscience, 2006.

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

None

3. Recommended Textbooks and Reference Material (Journals, Reports, etc)

1. Gilbert M. Masters, "Renewable and Efficient Electric Power System", John Wiley and Sons, Inc, 2005.
2. B. Sorensen, "Renewable Energy", Academic Press, Fourth Edition, 2010.

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

The program does not start yet and it depends on the instructor of the course.

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

ETAP student version (can be downloaded free of cost)

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 (3 Hours), Capacity = 20 Students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop may be provided.**
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 **End of Term (Semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application Software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** *** Final Exam question analysis**
3. Procedures for Teaching Development • **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** • **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvementplan.** • **Pedagogical workshop may be conducted to improve teaching.**
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness

and planning for developing it.
The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.

Name of Course Instructor: Dr. Mohammed S. Rezq

Signature: _____ Date Completed: 7-11-2017

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Microprocessor and Microcontroller**

Course Code: **802681**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: Microprocessor and Microcontroller (802681)
2. Credit hours: ***Three hours (3hrs)***
3. Program(s) in which the course is offered.
   Electrical Engineering (Smart Grid Engineering)
   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course
   Prof. Dr. Syed Misbahuddin
5. Level/year at which this course is offered:
   Elective
6. Pre-requisites for this course (if any):
   Department Consent
7. Co-requisites for this course (if any):
8. Location if not on main campus: N.A
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 course will enable graduate students to pursue research in the area of microprocessor and microcontroller applications in smart grid.

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)

CourseDescription:

Introduction to digital systems and their applications, Introduction to advances in microprocessors and Microcontrollers, Embedded Controllers and application, Instruction Set and Register Set for microprocessors and microcontrollers, programming microprocessors and microcontroller, microprocessor and microcontrollers Hardware Configuration, Resets and Interrupts, Clock and Timer Systems, Memory maps, Analog-To-Digital (A/D) and Digital- To analog (D/A), Converters, parallel interfacing , serial interfacing, microprocessor and microcontroller applications.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to digital systems and their applications smart grids	1	3
Introduction to Microprocessors with emphasis on X86 ISA architecture	1	6
Comparison between Microprocessor and Microcontrollers	1	3
Advantages of Microcontrollers	1	3
Programming Microprocessors and Microcontrollers	2	6
Clock and Timers in Microsensors and Microcontroller	1	3
Handling Reset and In in X86 Microprocessors	1	3
Memory Interfacing to Microprocessors	1	3
I/O Interfacing to Microprocessor and Microcontroller	1	3
Review of Analog to Digital and Digital to Analog convertor	1	3
Review of Analog to Digital and Digital to Analog convertor Interfacing	1	3
Serial interfacing to Microcontroller	1	3
Review of Communication protocols to Microprocessor and Microcontroller	1	3
Recent advances in Microcontroller	1	3
Total	**14**	**42**

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

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

	Actual						

3. Individual study/learning hours expected for students per week.	7

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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Understanding the application of digital systems in smart grid	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
1.2	Demonstrate an understanding of the microprocessor architecture, its instruction Set and addressing modes.	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
1.3	Develop and Analyze a given microprocessor program.	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
1.4	Demonstrate an understanding of the microprocessor control signals, bus cycles and timing.	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
1.5	Design of interface hardware for memory system		

	and I/O devices.		
2.0	**Cognitive Skills**		
2.1	Design a microprocessor-based system, component, or process to meet desired needs	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
2.2	Apply assembly language programming techniques to program Microprocessor-based/Microcontroller-Base systems	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
2.3	Students will Apply software and hardware interfacing knowledge to implement real-time systems. An ability to implement real-time systems	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
3.0	**Interpersonal Skills & Responsibility**		
3.1	The students will be able to understand the importance of life-long learning by performing independent research using library and Internet resources to come with the best solution for the Problem-Based Mini-Project. They are able to conduct professionally and ethically and take the responsibility of their learning	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
3.2	Part of the 10% students' assessment of the total grade is for effective communication, information technology and numerical skills. This assessment is done through Problem-Based mini-project assessment. The teams need to implement and present their solution in the form of prototype project and present it via PPT slides and written final report. They are required to include citations in the appropriate format to indicate their professional conduct.	Traditional Lectures	Prsentation
4.0	**Communication, Information Technology, Numerical**		
4.1	Working effectively in a research group	Independent research at a proficient level	Presentation of Research Project.
4.2	Present research project and write a technical report based on utilizing modern tools	Independent research at a	Presentation of Research

	simulation such as Embedded PCs and Simulation software	proficient level	Project.
	Students utilize modern tools such as computers and simulation	Independent research at a proficient level	Presentation of Research Project.
5.0	**Psychomotor(if any)**		
5.1	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**	**Proportionof Total Assessment**
1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	9	20%
3	TERM PROJECT	12	10%
4	FINAL EXAM	16	60%
5	TOTAL	--	100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks
   I. PIC Microcontroller and Embedded Systems: Using Assembly and C for Pic18
   Author: by Muhammad Ali Mazidi and Danny Causey
   ISBN: ISBN-13: 978-0131194045
   II. Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux 1st
   Author: Derek Molloy
   Edition ISBN-13: 978-1119188681

2. List Essential References Materials (Journals, Reports, etc.)
   I. Selected transaction and journal papers will be introduced as the course progresses.

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.

I. Embedded single board computers II. Microcontroller trainer boards

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 (3 Hours), Capacity = 20 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided.**
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 **At the end of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation**.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department I. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement. II. Final Exam question analysis
3. Procedures for Teaching Development I. EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of the result analysis) to the faculty. II. A pedagogical workshop may be conducted to improve teaching
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council

meeting. The recommendations of the faculty are documented. An action plan is made for changes after the approval of the Faculty Council and sent to the college council for approval and implementation.

Name of Course Instructor: Prof. Dr. SYED MISBAHUDDIN

Signature: _____ Date Completed: 25-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Modeling and simulation of static converters**

Course Code: **802682**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: ***Modeling and simulation of static converters*** (802682)
2. Credit hours: ***Three hours (3hrs)***
3. Program(s) in which the course is offered.
   Electrical Engineering (Smart Grid Engineering)
   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course
   Dr. Hasan Alrajhi
5. Level/year at which this course is offered:
   Elective
6. Pre-requisites for this course (if any):
   Department Consent
7. Co-requisites for this course (if any):
8. Location if not on main campus: N.A
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

4. The main objective of this course

This course will enable graduate students to pursue research in the area of design, modeling, and analysis of static, electronic, power converters. Even though the presented methodologies are rather general and thus applicable to various types of power-electronic converters, the emphasis will be on the three-phase Voltage-Sourced Converter (VSC) technology, which is widely employed in such systems as Distributed Energy Resource (DER) systems; active distribution systems and microgrids; wind, photovoltaic (PV), and fuel-cell energy systems; Flexible AC Transmissions Systems (FACTS); and High-Voltage DC (HVDC) transmission.

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)

CourseDescription:

Introduce basic ac-dc voltage source converter topologies, switching schemes and control options for high power transmission and distribution applications. Applications include converter interfaces for wind farm system, photovoltaic systems, VSC high voltage dc transmission, flexible ac transmission systems, and other generation and storage application. Introduce modeling and simulation methods for normal and abnormal operating conditions.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to high-power electronics, power switches, and power-electronic converter systems	1	3
Half-bridge Voltage-Sourced Converter (VSC) and Pulse-Width Modulation (PWM)	1	3
Switched and averaged models of the half-bridge VSC	1	3
Current-mode and voltage-mode control methods	1	3
Three-phase VSC, Sinusoidal PWM (SPWM), and SPWM with third harmonic injection	1	3
Space-phasors and a vectorial representation of three wire, three-phase systems	1	3
αβ-frame and dq-frame representations of three-wire, three-phase systems	1	3
Instantaneous real and reactive powers in three-wire, three-phase networks	1	3
Synchronization and the Phase-Locked Loop (PLL)	1	3
Real- and reactive-power control by the three-phase VSC	1	3

DC-link voltage regulation in the VSC, and Controlled DC-Voltage Power Port	1	3
State-space modeling and analysis of power-electronic converter systems	1	3
Sampled-data modeling and control of power-electronic converter systems	1	3
Review and analysis of important applications (wind power system, PV system, HVDC systems, etc.)	1	3
Total	**14**	**42**

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

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

3. Individual study/learning hours expected for students per week. 7

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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Analyzing and understanding the concept of static converter- voltage source converter (VSC)-, and its behavior	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam

1.2	Overview and benefits of the static converter in smart grids application based on VSC.	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
1.3	Modeling static converter in smart grids application.	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
2.0	**Cognitive Skills**		
2.1	Designing vector control for voltage source converter (VSC)	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
2.2	Students gain an appreciation and broad perspective of how power electronic converters are used and controlled	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
2.3	Students will apply both mathematics and physics to understand and solve problems in this course	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
3.0	**Interpersonal Skills & Responsibility**		
3.1	Realization of static converter operation and application	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
3.2	Designing controller loops for static converter	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
4.0	**Communication, Information Technology, Numerical**		
4.1	Working effectively in a research group	Independent research at a proficient level	Presentation of Research Project.
4.2	Present research project and write a technical report based on utilizing modern tools simulation such as PSCAD/ MATALB	Independent research at a proficient level	Presentation of Research Project.
	Students utilize modern tools such as	Independent	Presentation

	computers and simulation	research at a proficient level	of Research Project.
5.0	**Psychomotor(if any)**		
5.1	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	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	9	20%
3	TERM PROJECT	12	10%
4	FINAL EXAM	16	60%
5	TOTAL	--	100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks

III. A. Yazdani and R. Iravani, "Voltage-Sourced Converters in Power Systems", IEEE-John Wiley, ISBN 978-0-470-52156-4, 2010.

IV. G. P. Adam, Voltage Source Converter: modulation modelling control and applications in power systems, CreateSpace Independent Publishing Platform, 2014.

V. N. Mohan, T. M. Undeland and W. P. Robbins, "Power Electronics: Converters, Applications, and Design" Wiley, 2002, ISBN-10: 0471226939

VI. J. G. Kassakian, M. F. Schlecht, G. C. Verghese, "Principles of Power Electronics", Addison Wesley, ISBN 0-201-09689-7, 1992.

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

II. Selected transaction and journal papers will be introduced as the course progresses.

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.

III. MATLAB/SIMULINK
IV. PSCAD/EMTDC.

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 (3 Hours), Capacity = 20 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided.**
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 **At the end of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation**.
5. Other Strategies for Evaluation of Teaching by the Instructor or the Department III. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement. IV. Final Exam question analysis
6. Procedures for Teaching Development III. EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of the result analysis) to the faculty. IV. A pedagogical workshop may be conducted to improve teaching
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of the faculty are documented. An action plan is made for changes after the approval of the Faculty Council and sent to the college council for

approval and implementation.

Name of Course Instructor: Dr. HASAN ALRAJHI

Signature: _____ Date Completed: 25-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Adaptive Protection systems in smart Grid**

Course Code: **802683**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: Adaptive Protection systems in smart Grid (802683)
2. Credit hours: 3
3. Program(s) in which the course is offered.
   Electrical Engineering (Smart Grid Engineering)
   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course
   Prof. Tamer Kawady
5. Level/year at which this course is offered: **Elective**
6. Pre-requisites for this course (if any):
   Department Consent
7. Co-requisites for this course (if any): **None**
8. Location if not on main campus: **N.A.**
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 course is intended to cover deeply the basic concepts of adaptive protection systems in the field including benefits, requirements and applications. This specifically helps to expand the knowledge of the M.Sc. student with the essential art of recent protection engineering tools and their integrating in modern smart grids in power 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)

CourseDescription:

Modern Perspective of Protection Engineering, Overview and benefits of Adaptive Protection Systems, Pilot Relaying and adaptive distance protection, Adaptive Over Current Protection for Power Systems, Smart Relaying Coordination of Adaptive Overcurrent Relays, Adaptive Differential Protection Relays, Adaptive Protection Systems for Microgrids, Adaptive Wide Area Protection Systems for Smart Grids, Communication Requirements for Adaptive Protection Systems, Realization of Adaptive Protection Systems, Security Enhancement with Adaptive Protection Systems

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Modern Perspective of Protection Engineering	1	3
Overview and benefits of Adaptive Protection System	1	3
Pilot Relaying and Adaptive distance protection	2	6
Adaptive Over Current Protection for Power Systems	1	3
Smart Relaying Coordination of Adaptive Overcurrent Relays	1	3
Adaptive Differential Protection Relays	1	3
Adaptive Protection Systems for Microgrids	1	3
Adaptive Wide Area Protection Systems for Smart Grids	2	6
Communication Requirements for Adaptive Protection Systems	1	3
Realization of Adaptive Protection Systems	2	6
Security Enhancement with Adaptive Protection Systems	1	3
Total	14	42

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

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

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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Modern Perspective of Protection Engineering	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
1.2	Overview and benefits of Adaptive Protection System	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
1.3	Communication requirements for adaptive protection systems	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
2.0	**Cognitive Skills**		
2.1	Designing adaptive overcurrent, distance and differential relaying functions	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
2.2	Protection selectivity for microgrids and wide area monitoring	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
2.3	Improving system security with adaptive protection	Traditional Lectures	HW Assignments, Mid-tern Exam, Final Exam
3.0	**Interpersonal Skills & Responsibility**		
3.1	Realization of Adaptive Protection Systems	Traditional Lectures	Presentations and Reports
3.2	Security Enhancement with Adaptive Protection Systems	Traditional Lectures	Presentations and Reports
4.0	**Communication, Information Technology, Numerical**		
4.1	Working effectively in a research group	Independent research at a proficient level	Presentation of Research Project.
4.2	Present research project and write a technical report	Independent research at a proficient level	Presentation of Research Project.
5.0	**Psychomotor(if any)**		
5.1	N.A.		

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project,examination,speech,oralpresentation,	**Week Due**	**Proportion of Total**

	etc.)		Assessment
1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	9	20%
3	TERM PROJECT	12	10%
4	FINAL EXAM	16	60%
5	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks

1. **J. Lewis Blackburn, "Protective Relaying: Principles and Applications", CRC Press, Fourth Edition (Per Engineering, 2014.**
2. **Alfredo Vaccaro and Ahmed Faheem Zobaa, "Wide Area Monitoring, Protection and Control Systems: The enabler for smarter grids (Energy Engineering)", The Institution of Engineering and Technology (August 4, 2016)**

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

None

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

None

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

None

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 (3 Hours), Capacity = 20 Students

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

Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided.

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

At the end of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.

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

1. **Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.**
2. **Final Exam question analysis**

3. Procedures for Teaching Development

1. **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.**
2. **Pedagogical workshop may be conducted to improve teaching**

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)

Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.

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

The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.

Name of Course Instructor: Prof. Tamer Kawady

Signature: _____ Date Completed: 25-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **IoT and Smart Grid Communication**

Course Code: **802684**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: IoT and Smart Grid Communication (802684)
2. Credit hours: 3
3. Program(s) in which the course is offered. **ElectricalEngineering**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course : N/A
5. Level/year at which this course is offered: ----------
6. Pre-requisites for this course (if any): **Department Consent**
7. Co-requisites for this course (if any):
8. Location if not on main campus: N/A
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 course will cover the fundamentals of communications, before proceeding to the various techniques of transferring data from A to B. Concepts such as bandwidth, network capacity, performance metrics, data integrity, and communications media will be covered. Subsequently, the different communications technologies, both wireless and cable based, will be introduced, followed by their characteristics and application areas.

Smart Grid networks and their specific requirements, will be a focus area.

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)

None

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

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Overview of course that includes introduction to IoT, definition of data or information, data transmission media, introduction to waves, spectrum, and units, Information transfer, Modulation and demodulation fundamentals, Noise and SNR, and Antenna design.	1	3
Geography Considerations, and Energy Harvesting.	1	3
Digital transmission, i.e ASK, FSK, PSK, Spread Spectrum	1	3
Data Transfer – Radio: Technology overview: VHF, UHF, Microwave, Microwave links, GSM / GPRS, 3G / LTE, WiFi: 802.11 a/b/g/n/ac, Internet of Things (IoT)	3	9
Data Networking Basics, Switches & Routers, Network topologies, Protocols overview	2	6
Survey of Current IoT research and future research directions, Design an IoT device to work with a Cloud Computing infrastructure. Transfer IoT data to the cloud and in between cloud providers.	1	3
Security of real IoT protocols for communication deployments.	2	6
Understand and design communication mechanisms adapted to the constraints of the sensors (energy consumption, lack of computing capacities)	2	6
Acquire dual competences technical courses in advanced fields (data exploitation, software development, communication networks in constrained environments, Machine Learning, sensor security) associated with courses in Innovation, Project Management, and Entrepreneurship.	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	3					3
	Actual	3					3
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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Learn the fundamentals of analog and digital communications, communication requirements of protective relaying, communication networks in substations, and the integration of protection, communications, and control.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.2	ability to model tasks such as setting up a relay network, implementing relay-to-relay communications, and much more, and enhance understanding of the Smart Grid, and be more valuable to his/her organization.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.3	Build knowledge on Smart Grid challenges to the utility industry, and its impact on power system communications is notable.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.4	Learn the requirements placed on the substation communication system to meet the concurrent demands for protection, automation, and Smart Grid network implementation.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.5	Review of ongoing work on the development of Smart Grid interface standards under the aegis of IEEE, NIST, and NERC.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		

2.1	Evaluating and making decisions on limited information	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
2.2	Importance of cross-discipline knowledge for meaningful contribution to the energy debate.	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
2.3	Forming an engineering argument.		**HW Assignments, Mid-Term Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	Meet deadlines and work effectively in a research group.	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	Communication, Information Technology, Numerical		
4.1	Present research project and write a technical report	**Independent research at a proficient level**	**Presentation of Research Project.**

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**	**Proportionof Total Assessment**
1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	20%
4	FINAL EXAM	16	50%
5	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

6. List Required Textbooks

1/Smart Grids: Clouds, Communications, Open Source, and Automation (Devices, Circuits, and Systems) by David Bakken, CRC Press, ISBN: 9781482206111 2/Digital Communications: Fundamentals and Applications by Bernard Sklar and Pabitra Kumar Ray, Pearson, ISBN: 978813172092-9 3/ Modern Communiaction Systems Using MATLAB by Jhon G. Proakism Masoud Salehi and Gerhard Bauch by Cengage Learning, ISBK- 13: 978-81-315-1885-4/ISBN-10: 81-315-1885-X 4/ Wireless Communication and Networks by William Stallings, Pearson, ISBN: 0-13-191835-4 5/Introduction to Wireless and Mobile Systemes by Dharam Parkash Agawal and Qung-AN Zeng, Cengage Learning, ISBN-13: 978-1-4390-6205-0/ISBN-10: 1-4390-6205-6 6/Keyhani, Ali. *Design of Smart Power Grid Renewable Energy Systems.* IEEE Press, 2011. Textbook for a senior-level EE course on smart grids and renewables with Matlab projects in each chapter. Good course project possibilities for EEs. 7- Graph Theory with Applications to Engineering and Computer Scuence by Narsinfh Deo, PHI, ISBN- 81-203-0145-5 8- Communiaction Networks: Fundamental Concepts and Key Architecture by Alberto Leon-Garcia and Indra Widjaja, MC Graw Hill, ISBN: 0-07-24632-X/ISBN- 0-07-119848-2(ISE)
2. List Essential References Materials (Journals, Reports, etc.) https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5165411 https://www.nist.gov/engineering-laboratory/smart-grid https://www.nerc.com/Pages/default.aspx
8. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **Instructor's lecture notes and slides available on the Instructor's website** **https://www.emona-tims.com/emona-product/emona-online-labs/** **https://www.picotech.com/downloads**
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. IBM CPLEX Modeling software**, Matlab student version, Picoscop, and IoT based hardware labs.**

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 (3 Hours), Capacity = 20 Students
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **Non**

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **1. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** **2. Final Exam question analysis**
3. Procedures for Teaching Development **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan**
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation**

Name of Course Instructor: Dr. Abdulfattah Noorwali___

Signature: _____ Date Completed: 25-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Modeling and Operation of Electrical Grid**

Course Code: **802685**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code:
Modeling and Operation of Electrical Grids (802685)

2. Credit hours: **(3CHS)**

3. Program(s) in which the course is offered.
Master of Smart Grid Technologies

4. Name of faculty member responsible for the course
(Dr. Yassir Alhazmi)

5. Level/year at which this course is offered: **(3 or 4/2)**

6. Pre-requisites for this course (if any): **Department Consent**

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

8. Location if not on main campus: **NA**

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

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

Comments:
This Course is an Elective Course offered to Master of Smart Grid Technologies. The Mode of Instruction can be Designed to be Blended (50%)

B Objectives

1. The main objective of this course

This Course provides to students mainly two concepts:

- **Modeling and Computation Network**
- **Deregulation (Network Operation under liberalizing Market)**

Modelling Large Electric System, Classification of problems of electrical networks and their timing, Power System Matrices, Calculation of load Flows, Current calculation for systematic short-circuits using network matrices are covered in first part.
Networks operations, Interconnections in networks, Electricity markets, Market participants and scope of responsibility, Market mechanisms, Market models, and The regulator of energy markets are covered in the second part.

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)

MATLAB program or other programming languages will be assigned to improve students' skills to use modern tools of simulation utilized in the engineering practice. Also, a research about the best method to model deregulation system compatible with Saudi Electricity Market by comparing all teaching methods.

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

CourseDescription:

1. Topics to be Covered		
List of Topics	**No. of Weeks**	**Contact hours**
Introduction in Modeling and Computation Network	**1**	**3**
Modeling Large Electric System	**1**	**3**
Electrical System Problems and their Timing	**1**	**3**
Power System Matrices	**1**	**3**
Load Flow Calculation and Systematic short-circuit Calculation	**2**	**6**
Introduction to Deregulation system	**1**	**3**
Network Operation and Interconnections in Network	**2**	**6**
Electricity Market	**1**	**3**
Market Participants and Scope of Responsibilities	**1**	**3**
Market Mechanism and Model	**1**	**3**
The regulator of energy markets	**2**	**6**
Total	**14**	**42**

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.	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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Explain the concept of large electric system	Traditional Teaching	Homework, Quizzes and Exams
1.2	Analyze and classify the electrical system problems	Traditional Teaching	Homework, Quizzes and Exams
1.3	Understand how to evaluate Power Systems based on their matrices	Traditional Teaching	Homework, Quizzes and Exams
1.4	Explain the concept of Deregulation Systems	Traditional Teaching	Homework, Quizzes and Exams
1.5	Understand the meaning of Electricity Markets and their components	Traditional Teaching	Homework, Quizzes and Exams
1.6	Analyze and describe the responsibilities of the regulator of the electricity markets	Traditional Teaching	Homework, Quizzes and Exams

2.0	**Cognitive Skills**		
2.1	Design numerical methods to classify electrical system problems based on time	Traditional Teaching	Homework, Quizzes and Exams
2.2	Utilizing mathematical operations to evaluate power systems based on their matrices	Traditional Teaching	Homework, Quizzes and Exams
2.3	Identify, formulate, and solve Engineering problems	Traditional Teaching	Homework, Quizzes and Exams
2.4	Explain and Design the methods of numerical techniques which using to analyze the power flow analysis.	Traditional Teaching	Homework, Quizzes and Exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Ability to understand the importance of and engage in Life-long learning via independent Term-research paper using library and internet resources.	Traditional Teaching	Reports and Presentations
3.2	Ability to acting professionally and taking responsibility of learning and ability to conduct ethically.	Traditional Teaching	Reports and Presentations
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicate in Oral form via the class participation and discussion.	Oral discussion in the classroom	Term Project Presentation
5.0	**Psychomotor (None)**		

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	Classroom Participation	Weekly	%5
2	Homework Assignments	After each topic	%10
3	Quizzes (5 quizzes)	Biweekly	%5
4	Mid Term	8th	%20
5	Term Project	14th	%10
6	Final	16th – 17th	%50
	Total		%100

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)

Faculty is available for 4 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks **Hadjsaïd, N., & Sabonnadière, J. C. (2013). Power systems and restructuring. John Wiley & Sons**
2. List Essential References Materials (Journals, Reports, etc.) **Lai, Loi Lei (2003). Power System Restructuring and Deregulation: Trading, Performance and Information Technology. John Wiley & Sons**
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **None**
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **None**

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, (3 Hours), Capacity = 30 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **NA**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided.**

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into an access data base developed by a faculty for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **1. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.**

2. Final Exam question analysis
3. Procedures for Teaching Development **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty. Pedagogical workshop may be conducted to improve teaching**
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) **Comparison of standards of achievement is not done**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of student feedback surveys and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting.**

Name of Course Instructor: Dr. Yassir A. Alhazmi

Signature: _____ Date Completed: 30-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Energy management and Energy Efficiency in buildings**.

Course Code: .....**802686**.....

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code:			
2. Credit hours:			
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs)			
4. Name of faculty member responsible for the course	Prof. Anis AMMOUS		
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):			
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

* Understand energy consumption profiles of cities and buildings and to assess and discuss energy audit procedures.
* understand Efficient use of energy in buildings, factories, Emerging Transportation Technologies and other sectors
* Provide a framework of knowledge on how to design buildings, installations and products which operate in a more energy-efficient manner.
* an overview of energy efficiency concepts in residential and commercial buildings including design and construction fundamentals, passive and active systems, efficiency improvement opportunities, auditing and analysis techniques, certifications and standards, building commissioning, and operation and maintenance (O&M) concepts.

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)

None

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

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction	1	3
Energy management and auditing	3	9
Electrical Energy Management	2	6
Thermal Energy Management in buildings	2	6
Efficient use of energy	2	6
Approaches and design	2	6
Energy saving device & systems	2	6
Total	14	42

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	3					3
	Actual						
Credit	Planned	3					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.)

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	To understand Energy Consumption profile in a country/city and buildings	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.2	To perform Reactive power management, Energy conservation in domestic and industrial sectors, Energy conservation in lighting, motors, pumps and fan systems	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.3	To understand Efficient use of energy in buildings, factories, Emerging Transportation Technologies and other sectors,.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.4	To optimize of the performance of electrical appliances, products and systems, design principles to minimize energy use in buildings and devices.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.5	To understand Energy conservation in buildings, Building heating and cooling load management, Buildings code, solar passive and green building concepts	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	demonstrate an ability to integrate knowledge and to analyse, assess and deal with complex phenomena, issues and situations, even when limited information is available;	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.2	Importance of cross-discipline knowledge for meaningful contribution to the energy debate.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.3	Demonstrate the skill required to participate in research and development work or to work in other advanced contexts.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**

3.0	**Interpersonal Skills & Responsibility**		
3.1	Meet deadlines and work effectively in a research group.	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	**Communication, Information Technology, Numerical**		
4.1	Present research project and write a technical report	**Independent research at a proficient level**	**Presentation of Research Project.**

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	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	20%
4	FINAL EXAM	16	50%
5	TOTAL		100%

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

*Power Theft

G. Sreenivasan PHI Learning Private Limited,

ISBN 8120342518, 9788120342514, 140 pages

*Clark W Wellings, "The Smart Grid, Enabling Energy Efficiency and Demand Side Response"- CRC Press, 2009.

*Jean Claude Sabonnadière, Nouredine Hadjsaïd, "Smart Grids", Wiley-ISTE, IEEE Press, May 2012

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

*Bushby, S.T. and Holmberg, D.G., Advancing Automated Demand Response Technology, *ASHRAE Transactions*, 2009, Volume 115, Issue 1, pp. 333-337.
*Taqqali, W.M. and Abdulaziz, N., Smart Grid and Demand Response Technology, *2010 IEEE*

International Energy Conference, p. 710-715. * J. Lal, Energy-efficient Building Systems: Green Strategies for Operation and Maintenance, New York: McGraw-Hill, 2007 * J. Trost, Design of Mechanical and Electrical Systems in Buildings, Upper Saddle River, N.J.: Pearson/Prentice Hall, 2004 * C. Beggs, Energy: Management, Supply and Conservation, Oxford: Butterworth-Heinemann, 2002 * P. Bertoldi, A. Ricci and A.D. Almedia, Energy Efficiency in Household Appliances and Lighting, Berlin, New York: Springer, 2001
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **Instructor's lecture notes and slides available on the Instructor's website**
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 (3 Hours), Capacity = 20 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Non

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **1. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** **2. Final Exam question analysis**
3. Procedures for Teaching Development **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of**

result of analysis) to the faculty. **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan**
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation**

Name of Course Instructor: _ Prof. Anis AMMOUS_____

Signature: _____ Date Completed: __28-02-2-19__

Program Coordinator: _____

Signature: _____

Course Title: **DC voltage Transmission and distribution in Smart Grids**

Course Code: **802687**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department**	

A. Course Identification and General Information

1. Course title and code: **DC voltage Transmission and distribution in Smart Grids** (802687)			
2. Credit hours: 3			
3. Program(s) in which the course is offered. **ElectricalEngineering** (If general elective available in many programs indicate this rather than list programs)			
4. Name of faculty member responsible for the course : Prof. Anis AMMOUS			
5. Level/year at which this course is offered:			
6. Pre-requisites for this course (if any): **Department Consent**			
7. Co-requisites for this course (if any):			
8. Location if not on main campus: N/A			
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 course focuses on two main parts,

1/ the first related to HVDC transmission: Development of HVDC technology, economics, comparison with HVAC systems, principles of HVDC conversion, HVDC lines, HVDC sub-stations-converters, AC & DC harmonics & filtering

2/ the second related to DC distribution systems: Comparison between LVAC &LVDC, line and load converters, control methods of the LVDC network, medium and low voltage cables in distribution networks in smart grids...

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) None

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

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Analysis of HVDC converters	**2**	**6**
Converter and HVDC system control	**2**	**6**
reactive power and harmonics control	**2**	**6**
Power flow analysis in ac/dc systems	**2**	**6**
LVDC Electrical Power Architectures	**2**	**6**
Power quality in the LVDC network	**2**	**6**
Line and load converters in DC voltage distribution systems	**2**	**6**
Medium and low dc voltage cables in smart grids	**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	3					3
	Actual						
Credit	Planned	3					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.

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	To be able to acquaint with HV transmission	Traditional	**HW**

	system with regard to power handling capacity, losses, conductor resistance and electrostatic field associate with HV. Further knowledge is gained in area of bundle conductor system to improve electrical and mechanical performance.	Lecture	**Assignments, Mid-tern Exam, Final Exam**
1.2	To be able to acquire knowledge in transmission of HVDC power with regard to terminal equipments, type of HVDC connectivity and planning of HVDC system.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.3	To develop knowledge of reactive power requirements of conventional control, filters and reactive power compensation in AC. side of HVDC system.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.4	To develop LVDC Electrical Power Architectures	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.5	To develop line and load converters in DC voltage distribution systems	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.6	To develop control methods of the LVDC network	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	Evaluating and making decisions on limited information related to DC voltage transmission and distribution in Smart Grids	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
2.2	Importance of cross-discipline knowledge for meaningful contribution to the energy transmission and distribution debate.	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
2.3	Forming an engineering arguments.	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
2.3	Importance and Advantages of LVDC for homes	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final**

			Exam
3.0	**Interpersonal Skills & Responsibility**		
3.1	Meet deadlines and work effectively in a research group.	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	Communication, Information Technology, Numerical		
4.1	Present research project and write a technical report	**Independent research at a proficient level**	**Presentation of Research Project.**

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	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	20%
4	FINAL EXAM	16	50%
5	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

7. List Required Textbooks

1/ Transmission and Distribution Electrical Engineering, Book • 4th Edition • 2011
By C.R. Bayliss and B.J. Hardy

2/ DC Distribution Systems and Microgrids (Energy Engineering)

by Tomislav Dragičević (Editor), Pat Wheeler (Editor), Frede Blaabjerg (Editor)

3/ DC Distribution System for Data Center Hardcover – Import, 27 Jan 2017

by Marjan Javanshir

4/ HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited, and Publishers.
5/ Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons.
6/ EHVAC Transmission Engineering by R. D. Begamudre, New Age International (P) Ltd.

7/ Factors Affecting Efficiency of LVDC Distribution Network: Power Electronics Perspective Paperback – 11 Oct 2016 by Jenni Rekola, LAP LAMBERT Academic Publishing

8/ Code of Practice for Low and Extra Low Voltage Direct Current Power Distribution in Buildings, IET Standards , Year: 2015

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

- EHVAC and HVDC Transmission Engineering and Practice – S.Rao.
- Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications
- HVDC Transmission – J. Arrillaga.

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

Instructor's lecture notes and slides available on the Instructor's website
http://www.greentechmedia.com/articles/read/a-hidden-benefit-of-dc-power-real-estate
http://www.greentechmedia.com/articles/read/Time-to-Rethink-the-Use-of-DC-Power-for-the-Energy-Smart-Home
https://www.ecmweb.com/contractor/dc-house
https://www.ensto.com/industries/electricity-distribution/lvdc-microgrid/

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

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 (3 Hours), Capacity = 20 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **Non**

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **1. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** **2. Final Exam question analysis**
3. Procedures for Teaching Development **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan**
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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation**

Name of Course Instructor: Prof. Anis AMMOUS___

Signature: _____ Date Completed: 25-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Solar Thermal Electricity**

Course Code: **802690**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**

2. College/Department
College of Engineering and Islamic Architecture / Electrical Engineering Department

A. Course Identification and General Information

1. Course title and code: Solar Thermal Electricity (802690)
2. Credit hours: 3
3. Program(s) in which the course is offered. **ElectricalEngineering**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course : Prof. Anis AMMOUS
5. Level/year at which this course is offered: ----------
6. Pre-requisites for this course (if any): **Department Consent**
7. Co-requisites for this course (if any):
8. Location if not on main campus: N/A
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
- Understand geographic and climate considerations of solar thermal technologies capabilities and constraints.
- Evaluate various technology options.
- Understand the various operating principles of parabolic trough, linear Fresnel, power tower, and dish engine CSP systems.
- Assess factors to integrate thermal and CSP into larger energy 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)
None

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

1. Topics to be Covered		
List of Topics	**No. of Weeks**	**Contact hours**
Solar Radiation and economics	**2**	**6**
Parabolic trough Power Plants	**2**	**6**
Dish/Stirling Systems	**2**	**6**
Solar Tower Power Station	**2**	**6**
Thermal storage systems	**2**	**6**
Solar Thermal Applications	**2**	**6**
Cost Trends for Solar Thermal Electricity and Market situation	**1**	**3**
The global Solar Thermal Electricity Outlook Scenarios	**1**	**3**
Total	**14**	**42**

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

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods

1.0	**Knowledge**		
1.1	To provide an overview of the present usage and development of various solar, geothermal, and relevant thermal technologies and their future prospects.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.2	To understand the basic principles and process of each of technologies.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.3	To perform calculations to location the sun ‘s position in the sky at any particular time of the day.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.4	To perform simple efficiency calculations of some typical thermal systems	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.5	To perform a simple economic and environmental assessment of the sustainable thermal technologies.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.6	To enable team investigations on the feasibility of renewable energy design systems that meet specific energy demands and minimal environmental impact requirements.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
1.7	To develop the ability to analyse and compare thermal energy systems and choose the most suitable for given conditions.	Traditional Lecture	**HW Assignments, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	demonstrate an ability to integrate knowledge and to analyse, assess and deal with complex phenomena, issues and situations, even when limited information is available;	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
2.2	Importance of cross-discipline knowledge for meaningful contribution to the energy debate.	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
2.3	Demonstrate the skill required to participate in research and development work or to work in other advanced contexts.	Traditional Lecture	**HW Assignments, Mid-Term Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	Meet deadlines and work effectively in a research group.	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	Communication, Information Technology, Numerical		
4.1	Present research project and write a technical report	**Independent research at a proficient level**	**Presentation of Research Project.**

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	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	20%
4	FINAL EXAM	16	50%
5	TOTAL		100%

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

8. List Required Textbooks

1. Energy Conversion. Yogi Goswami and Frank Kreith, CRC Press, 2008 (ISBN 1-42004-431-1)

2. Handbook of Energy and renewable Energy. Frank Kreith and Yogi Goswami, CRC Press, 2007 (ISBN 0-8493-1730-4)

3. Treatise on Solar Energy, Volume : Fundamentals of solar Energy, H.P Garg, 1982, ISBN 0471 10180X, 1982

4. John A. Duffie and William A. Beckman, " *Solar Engineering of Thermal Processes*," John Wiley and Sons, Inc., ISBN 978-0-470-87366-3 (2013).

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

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

Instructor's lecture notes and slides available on the Instructor's website

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

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 (3 Hours), Capacity = 20 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **Non**

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **1. Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** **2. Final Exam question analysis**
3. Procedures for Teaching Development **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan**

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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation**

Name of Course Instructor: Prof. Anis AMMOUS___

Signature: _____ Date Completed: 25-10-2018

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Photovoltaic Solar Cell Physics and Technologies**

Course Code: **802691**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: **Photovoltaic Solar Cell Physics and technologies (802691)**
2. Credit hours: **3**
3. Program(s) in which the course is offered. **Electrical Engineering (Electronics and communications)** (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course: **Dr Tarek M. Abdolkader**
5. Level/year at which this course is offered: **level 2/ Year 1**
6. Pre-requisites for this course (if any): **Solid state Devices (8023120-3) or any similar courses from other university**
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:
Upon completion of this course, the student will be aware of the physics of photovoltaic solar cells and its interaction with light. The student will be able to evaluate solar cell performance using various modeling and simulation techniques.

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)
The course is updated continuously to add new trends in modeling and new software tools used for solar cell simulation.

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

CourseDescription:
This course explains the basics of semiconductor materials used for solar cells, the spectral distribution of sunlight and its absorption mechanisms, illustrates the principle of operation of various photovoltaic solar cells including silicon solar cells, thin film solar cells and organic solar cells. In addition, the course illustrates and compares various modeling and simulation techniques of pv solar cells including simple analytical models, SPICE models, and numerical simulation through computersoftwarepackages.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Review of Semiconductor Physics: doping, carrier transport, Photo carrier generation and recombination	2	6
Solar radiation: Nature of sunlight, solar spectrum, Planck's law, air mass ratio, conversion efficiency, absorption coefficient	1	3
p-n and p-i-n junctions: Depletion region, Current voltage characteristics in dark and light	2	6
Solar cell modeling: p-n junction model, Effect of Parasitic resistance, effect of temperature on I-V characteristics, SPICE modeling of solar cells	3	9
Crystalline Silicon and III-V Solar cells	2	6
Thin Film Solar cells: Amorphous silicon, cadmium telluride and copper indium gallium di-selenide based solar cells	1	3
Organic photovoltaic Devices	1	3
Numerical simulation of solar cells using SCAPS software	2	6
Numerical simulation of solar cells using ADEPT software	1	3

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

CurriculumMap

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Students will be able to describe various recombination-generation mechanisms in semiconductors	lectures with power point presentations	in-class quizzes, written exams, and homeworks
1.2	Students will be able to describe solar spectrum and its details,	lectures with power point presentations	in-class quizzes, written exams, and homeworks
2.0	**Cognitive Skills**		
2.1	Students will be able to explain carrier statistics and electrical conduction in semiconductors using band theory of solids.	lectures with power point presentations	in-class quizzes, written exams, and

			homeworks
2.2	Students will be able to explain photoelectric effect, apply Planck's law on light-matter interaction, calculate the absorbed light in a semiconductor	lectures with power point presentations	in-class quizzes, written exams, and homeworks
2.3	Students will be able to explain p-n junction model, Effect of Parasitic resistance, effect of temperature on I-V characteristics and develop SPICE models for PV solar cells	lectures with power point presentations	in-class quizzes, written exams, and homeworks
2.4	Students will be able to explain the operation of crystalline Silicon and III-V Solar cells	lectures with power point presentations	in-class quizzes, written exams, and homeworks
2.5	Students will be able to explain the operation of thin Film Solar cells	lectures with power point presentations	in-class quizzes, written exams, and homeworks
2.6	Students will be able to explain the operation of organic photovoltaic Devices	lectures with power point presentations	in-class quizzes, written exams, and homeworks
3.0	**Interpersonal Skills & Responsibility**		
3.1	Students will be able to act professionally and to take responsibility of learning.	In-class discussions	homework assignments (deadlines - organization)
3.2	Student will be able to conduct ethically.	In-class discussions	homework assignments (penalty of cheating)
4.0	**Communication, Information Technology, Numerical**		
4.1	Students will be able to use solar cell numerical simulation tools (SCAPS & ADEPT) software	Software training	Computer 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	Classroom participation and activity	All weeks	5%
2	HW and computer assignments	Alternate	10%
3	Quizzes	Every 4 weeks	15%
4	Major Exams	7th& 11th	20%
5	Final Examination	16th	50%
6	Total		100%
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)

Faculty member is available for 2 hours per week per class for regular office hours to meet with the students for consultation and advice.

The students are also welcome to meet the faculty by appointment outside the regular office hours for this course. Consultation is made also through the electronic learning gate through discussions and Emails.

E Learning Resources

1. List Required Textbooks

Honsberg, C., and S. Bowden. *Photovoltaics: Devices, Systems and Applications*. [A free online resource.]

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

- **J. Nelson, "The physics of solar cells" (imperial college, 2003)**
- **Juan Bisquert, The Physics of Solar Cells: Perovskites, Organics, and Photovoltaic Fundamentals, 1st edition, CRC press, 2017.**
- **P. Wurfel, "physics of solar cells" (Wiley-VCH, 2013)**
- **S. J. Fonash, "Solar cell device physics (AP, 2010).**

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

http://uqu.edu.sa/staff/ar/4310394, https://elearn.uqu.edu.sa

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

SCAPS software: http://scaps.elis.ugent.be/SCAPSinstallatie.html

ADEPT software: https://nanohub.org/resources/adept/

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, Capacity = 30 Students**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Computer lab for computer software training, 20 computers.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop should be available**

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **At the end of the semester, confidential Student Feedback surveys are conducted for each course. Data is entered into an access database for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Faculty submit course folders containing graded samples of students' work and exam questions' analysis**
3. Procedures for Teaching Development **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.**
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) **Comparison of standards of achievement is not usually done.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty members are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation**

Name of Course Instructor: ___Tarek M Abdolkader_____

Signature: _____ Date Completed: ___23/11/2018_____

Program Coordinator: ____Dr Muhammad S. AlSheikh_____

Signature: _____ Date Received: _____

Course Title: **Electrical Machines and Drives for Renewable Energy systems**

Course Code: **802692**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department **College of Engineering and Islamic Architecture / Electrical Engineering Department** (802692)	

A. Course Identification and General Information

1. Course title and code: **Electrical Machines and Drives for Renewable Energy systems (802692)**			
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) **ElectricalEngineering**			
4. Name of faculty member responsible for the course N/A			
5. Level/year at which this course is offered: **DisciplineElective**			
6. Pre-requisites for this course (if any): **Department Consent**			
7. Co-requisites for this course (if any) **None**			
8. Location if not on main campus N/A			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	√	What percentage?	**100%**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	
Comments:			

B. Objectives

1. What is the main purpose for this course? **The course provides the students with the new applications of power electronics, the application of multi-level converter, scalar control, vector control and direct torque control. Those applications used in the renewable energy and smart grids, speed control of DC and AC machines, UPS systems.**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field) **To improve this course, more emphasis and weight will be given to:** • **Using *MATLAB* based presentations to describe the concepts**

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description: **Advanced topics include: scalar control of induction motor, direct and indirect field orientation control of AC machines, direct torque control "DTC" of induction motor, UPS: construction, types, applications and applications of vector control and DTC in speed control and renewable energy.**

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
representation AC machine in the all frames of DQ and scalar control of induction motor	**2**	**6**
direct field orientation control of AC machines and Indirect field orientation control of AC machines	**3**	**9**
direct torque control "DTC" of induction motor	**2**	**6**
UPS and applications of Vector	**3**	**9**
applications in renewable energy	**2**	**6**
Applications of speed control using DTC in wind energy.	**2**	**6**
Total	**14**	**42**

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

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**3**	-	-	-	-	**3**
Credit	**3**	-	-	-	-	**3**

3. Additional private study/learning hours expected for students per week. **Provide by the professor**	**3**

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

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

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	**Able to describe the representation AC machine in the DQ-frame and scalar control of induction motor**	**Traditional Lectures at a proficient level**	**HW Assignments, Mid-tern Exam**
1.2	**Able to explain the direct and the indirect field orientation control of AC machines**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-tern Exam, Final Exam**
1.3	**Able to describe the direct torque control "DTC" of induction motor**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-tern Exam, Final Exam**
2.0	**Cognitive Skills**		
2.1	**Abel to apply knowledge of in the renewable energy**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-Term Exam, Final Exam**
2.2	**Able to analysis the application in the speed control using DTC and vector control**	**Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level**	**HW Assignments, Mid-Term Exam, Final Exam**
3.0	**Interpersonal Skills & Responsibility**		
3.1	**Meet deadlines and work effectively in a research group.**	**Discussions in groups at a proficient level**	**Presentations and Reports**
4.0	**Communication, Information Technology, Numerical**		
4.1	**Present research project and write a technical report**	**Independent research at a proficient level**	**Presentation of Research Project.**

6. Schedule of Assessment Tasks for Students During the Semester			
	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	10%
4	FINAL EXAM	16	60%
	TOTAL		100%

D. Student Academic Counseling and Support

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

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks

1. Bimal K. Bose," Power Electronics and Motor Drives: Advances and Trends ", Elsevier Inc, 2006.
2. Peter Vas, " Vector Control of AC Machines", Oxford University Press, 1995.
3. Krause, P. C., "Analysis of Electric machinery", McGraw-Hill, 2001.
4. Bimal K. Bose, "Modern Power Electronics and AC Drives", Prentice, 2001
5. Mohan N., Tore M. Underand, William P. Robbins, “Power Electronics: converters, Applications , and Design”, John Wiley & Sons, Inc , third Edition, 2003.
6. M. H. Rashid, “Power Electronics Handbook”, 2nd Ed., Academic Press, 2006.
7. Peter Vas," Sensorless Vector and Direct Torque Control", Oxford University Press,1998.

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

Decide by the Professor

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

Decide by the Professor

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

Non.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **MATLAB student version**

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.)
2. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **Classroom (3 Hours), Capacity = 20 Students**
2. Computing resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **None**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department *** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** *** Final Exam question analysis**
3 Processes for Improvement of Teaching **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan.** **Pedagogical workshop may be conducted to improve teaching**

4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.**

Name of Instructor: Dr Gamal Sowilam

Signature: _____ Date Report Completed: 25-10-2018

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received: _____

Course Title: **Facts and Power Quality**

Course Code: **802693**

Course Specifications

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department (802697)	

A. Course Identification and General Information

1. Course title and code: **Facts and Power Quality/ (802693)**			
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) **Electrical Engineering**			
4. Name of faculty member responsible for the course N/A			
5. Level/year at which this course is offered: **Discipline Elective**			
6. Pre-requisites for this course (if any): **Department Consent**			
7. Co-requisites for this course (if any) **None**			
8. Location if not on main campus N/A			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	√	What percentage?	**100%**
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	
Comments:			

B Objectives

1. What is the main purpose for this course?

Power quality is necessary for electrical systems to operate in their intended manner without any deterioration of performance. Power Quality in Future Electrical Power Systems is a tool for planners, designers, operators and practicing engineers of electrical power systems who are concerned with power network quality, reliability, and security.

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

To improve this course, more emphasis and weight will be given to:

- **Using *MATLAB* based presentations to describe the concepts**

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:

Topics include power quality definitions; frequency-domain power theory and metering of harmonic pollution responsibility; active and passive harmonic filters; shunt flexible AC transmission; power quality improvement using series FACTS; distributed generation systems; decentralized voltage control in smart grids; techno-economic issues of power quality; and future trends in power quality.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Power quality definitions and Frequency-domain Power theory and Metering of Harmonic Pollution Responsibility	**3**	**9**
Active and Passive Harmonic Filters	**3**	**9**
shunt flexible AC transmission; power quality improvement using series FACTS	**4**	**12**
distributed generation systems; decentralized voltage control in smart grids; techno-economic issues of power quality; and future trends in power quality.	**4**	**12**
Total	**14**	**42**

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

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**3**	**-**	**-**	**-**	**-**	**3**

Credit	3	-	-	-	-	3

3. Additional private study/learning hours expected for students per week. **3**
Provide by the professor

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

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

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Able to define Power quality and FACTs	Traditional Lectures at a proficient level	HW Assignments, Mid-tern Exam
1.2	Able to explain Frequency-domain Power theory	Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level	HW Assignments, Mid-tern Exam, Final Exam
1.3	Able to describe Metering of Harmonic Pollution Responsibility	Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level	HW Assignments, Mid-tern Exam, Final Exam
1.4	Able to explain power quality improvement using series FACTS	Traditional Lectures at a proficient level	HW Assignments, Mid-tern Exam, Final Exam
2.0	**Cognitive Skills**		
2.1	Able to design shunt flexible AC transmission	Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level	HW Assignments, Mid-Term Exam, Final Exam
2.2	Able to analysis power quality improvement using series FACTS	Traditional Lectures at a proficient level and *MATLAB* Presentations at an advanced level	HW Assignments, Mid-Term Exam, Final Exam
3.0	**Interpersonal Skills & Responsibility**		
3.1	Meet deadlines and work effectively in a research group.	Discussions in groups at a proficient level	Presentations and Reports
4.0	**Communication, Information Technology, Numerical**		
4.1	Present research project and write a technical report	Independent research at a proficient level	Presentation of Research Project.

5. Schedule of Assessment Tasks for Students During the Semester			
	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	HW ASSIGNEMENTS	Bi-Weekly	10%
2	MID-TERM EXAM	10	20%
3	TERM PROJECT	12	10%
4	FINAL EXAM	16	60%
	TOTAL		100%

D. Student Academic Counseling and Support

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

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks

1. Ahmed F. Zobaa and Shady H.E Abdel, "Power Quality in Future Electrical Power Systems", IET Publishers, 2017.
2. J.Arillaga, N.R.Watson and S.Chen, "Power System Quality Assessment", John Wiley & Sons, England, 2000.
3. Vijay K. Sood, "HVDC and FACTs Controllers: Applications of static converters in power systems", Kluwer Academic Publishers, 2004.
4. E. Acha, C. R. Fuerte-Esquivel, H. Ambriz-Perez, C. Angeles-Camacho, " FACTS Modeling and Simulation in Power Networks", John Wiley & Sons Ltd, 2004
5. R.M. Mathur and R.K. Varma, "Thyristor-Based FACTS Controllers for Electrical Transmission Systems", IEEE Press and John Wiley & Sons, New York, USA, Feb. 2002, ISBN: 978-0-471-20643-9
6. N. G. Hingorani and L. Gyugi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press, 2000.
7. N. G. Hingorani and L. Gyugyi, "Understanding FACTS, the Institute of Electrical and Electronics Engineers", New York, 2000.

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

Decide by the Professor

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

Decide by the Professor

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

Non

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

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.)
3. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) **Classroom (3 Hours), Capacity = 20 Students**
2. Computing resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop provided.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **None**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching **End of Term (semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application software data base for assessment and evaluation.** 2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department *** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** *** Final Exam question analysis**
3 Processes for Improvement of Teaching **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan.** **Pedagogical workshop may be conducted to improve teaching**
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5 Describe the planning arrangements for periodically reviewing course effectiveness and

planning for improvement.
The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.

Name of Instructor: Dr Gamal Sowilam

Signature: _____ Date of completion : 25-10-2018

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received: _____

Course Title: **Advanced Topics in Communications Engineering**

Course Code: **802694**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: **ADVANCED TOPICS IN COMMUNICATIONS ENGINEERING [802694]**			
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) **Electrical Engineering**			
4. Name of faculty member responsible for the course **N/A**			
5. Level/year at which this course is offered: **Discipline Elective**			
6. Pre-requisites for this course (if any): **Department Consent**			
7. Co-requisites for this course (if any): **None**			
8. Location if not on main campus: N/A			
9. Mode of Instruction (mark all that apply):			
a. Traditional classroom	X	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 course is intended to cover any advanced topics in communication engineering that are not included in the program and the student is interested to acquire new knowledge and current knowledge of the field**.

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)
None

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

Course Description:
This course deals with the most current knowledge of the field and entails solving contemporary issues and problems of the humanity using prevailing theory and techniques. The topics covered in this course will be related to the research interests of the faculty teaching the course.

1. Topics to be Covered
The topics will be related to the research interest of the faculty teaching the course.
It is likely that each topic will be covered in two weeks and total of 42 contact hours will be utilized to teach this course in 14 weeks.

List of Topics	No. of Weeks	Contact hours
Total	**14**	**42**

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

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

Course Learning Outcomes, Teaching Strategies, and Assessment Methods will be prepared by the faculty teaching the course.

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			
4.0	**Communication, Information Technology, Numerical**		
4.1			

5. Assessment Task Schedule for Students During the Semester

This schedule will be prepared by the faculty teaching the course.

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1			
2			
3			
4			

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)

Faculty is available for 2 hours per week for regular office hours to meet with the students for consultation and advice. The students are also welcome to meet the faculty by appointment outside the regular office hours for this course.

E Learning Resources

1. List Required Textbooks

Faculty teaching the course will prepare this list.

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

Prepared by faculty teaching the course.

3. Recommended Textbooks and Reference Material (Journals, Reports, etc)

None

4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **None**
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. **Engineering Standards available on the Internet will be studied**

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 (3 Hours), Capacity = 20 Students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **Classroom must be equipped with computer and overhead projector otherwise portable projector and laptop may be provided.**
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 **End of Term (Semester) confidential Student Feedback surveys are collected for each course. Data is entered into CLOSO Application Software data base for assessment and evaluation.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department *** Faculty submit course folders containing graded samples of students' work, Instructor's Course Report including the cumulative grade point average (CGPA) of the course and recommendations/suggestions for improvement.** *** Final Exam question analysis**
3. Procedures for Teaching Development • **EE program Assessment Committee analyze the assessment data collected through various sources, e.g., Student Feedback surveys, Final Exam Question and close the loop by providing feedback (in the form of result of analysis) to the faculty.** • **Faculty writes Improvement Plan for each course he teaches, implement this plan in the next semester and analyze the results to see the effect of improvement plan.** • **Pedagogical workshop may be conducted to improve teaching.**

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) **Marking or grading by an independent member of teaching staff of a sample of student work will be utilized to verify the extent of Student Achievement.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **The results of assessment and evaluation of feedback and Final exam questions is discussed with the entire faculty (by Assessment Committee) during the Faculty Council meeting. The recommendations of faculty are documented. An action plan is made for changes after the approval of Faculty Council and sent to college council for approval and implementation.**

Name of Course Instructor: Dr. Mohamed Alshaikh

Signature: _____ Date Completed: 7-11-2017

Program Coordinator: _____

Signature: _____ Date Received: _____

Course Title: **Advanced Topics in Electrical Power Engineering**

Course Code: **802696**

1. Institution	Date
Umm Al-Qura University	**October 25, 2018**
2. College/Department	
College of Engineering and Islamic Architecture / Electrical Engineering Department	

A. Course Identification and General Information

1. Course title and code: **Advanced Topics In Electrical Power Engineering (802696)**			
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) **Electrical Engineering**			
4. Name of faculty member responsible for the course **N/A**			
5. Level/year at which this course is offered: **Discipline Elective**			
6. Pre-requisites for this course (if any): **Department Consent** 7. Co-requisites for this course (if any): **None**			
8. Location if not on main campus: N/A			
9. Mode of Instruction (mark all that apply):			
a. Traditional classroom	X	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 course is intended to cover any advanced topics in electrical power engineering that are not included in the program and the student is interested to acquire new knowledge and current knowledge of the field.**

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)
None

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

Course Description:
This course deals with the most current knowledge of the field and entails solving contemporary issues and problems of the humanity using prevailing theory and techniques. The topics covered in this course will be related to the research interests of the faculty teaching the course.

1. Topics to be Covered
The topics will be related to the research interest of the faculty teaching the course.
It is likely that each topic will be covered in two weeks and total of 42 contact hours will be utilized to teach this course in 14 weeks.

List of Topics	No. of Weeks	Contact hours
Total	**14**	**42**

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

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

Course Learning Outcomes, Teaching Strategies, and Assessment Methods will be prepared by the faculty teaching the course.

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			
4.0	**Communication, Information Technology, Numerical**		
4.1			

5. Assessment Task Schedule for Students During the Semester

This schedule will be prepared by the faculty teaching the course.

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1			
2			
3			
4			

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Name of Course Instructor: Dr. Mohamed Alshaikh

Signature: _____ Date Completed: 7-11-2017

Program Coordinator: _____

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