هيئة تقويم التعليم
Education Evaluation Commission
المركز الوطني للتقويم والاعتماد الأكاديمي
National Center for Academic Accreditation and Evaluation

ATTACHMENT 5.

T6. COURSE SPECIFICATIONS (CS)

(PHYS 546)

Solar radiation: Models and applications

by

Dr. Samah El-Bashir
2018

هيئة تقويم التعليم
Education Evaluation Commission

Course Specifications

Institution: King Saud University	Date: 1/1/2018
College/Department: College of Science, Physics and Astronomy Department	

A. Course Identification and General Information

1. Course title and code: Solar radiation: Models and Applications (PHYS 546)
2. Credit hours: **2(2+0)**
3. Program(s) in which the course is offered.
(If general elective available in many programs indicate this rather than list programs)
Physics and other science and engineering programs
4. Name of faculty member responsible for the course
Dr. Samah El-Bashir
5. Level/year at which this course is offered: 3rd level (post-graduate)
6. Pre-requisites for this course (if any):
7. Co-requisites for this course (if any):
8. Location if not on main campus:
Main campus in Diriyah , College of Science, Department of Physics & Astronomy (Boys and Girls sections)
9. Mode of Instruction (mark all that apply):

a. traditional classroom	√	What percentage?	60%
b. blended (traditional and online)	√	What percentage?	40%
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 student should be informed with the fundamentals of solar radiation models and their applications.
   - The student should be able to apply this course in his/her future research work, as the success of solar energy conversion system is mainly dependent on the type of solar radiation incident on the location.

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)
   - Electronic materials and computer based programs have been utilized to support the lecture course material.
   - The course material was posted on the Website that could be accessed by the students enrolled in the course.

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

Course Description:
Solar physics, Electromagnetism radiation, Universal and terrestrial solar radiation, Geometrical factors for solar radiation and atmospheric layers, Solar radiation equations, Solar radiation tables, Solar radiation measurements, Models and applications.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Chapter 1: The Earth and the Sun	1.5 week	3
Chapter 2: Solar time and solar position	1.5 week	3
Chapter 3: Solar radiation measurements	1.5 week	3
Chapter 4: Modelling of clear sky solar radiation	1.5 week	3
Chapter 5: Modeling Global Irradiance under All Sky Conditions	1.5 week	3
Chapter 6: Modeling Missing solar irradiance Components	1.5 week	3
Chapter 7: Modeling Solar Radiation Available to Collectors	1.5 week	3
Chapter 8: Solar Collector Geometries	1.5 week	3
Chapter 9: Introduction to Modeling Spectral Distributions	1.5 week	3
Chapter 10: Introduction to Modeling Daylight	1.5 week	3

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	Planed	30					30
	Actual	30					30

Credit	Planed	30					30
	Actual	30					30

3. Additional private study/learning hours expected for students per week. 2 hours

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.

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 intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
	- To understand the properties of solar radiation - To get acquainted with types of solar radiation at different air mass - To get an experience solar radiation recording methods. - To use different models to determine solar radiation components at different location latitudes	•Introducing the basic links between theory and applications in solar energy conversion systems. •Homework assignments •Lecture discussions	- In-class quizzes - Midterms and final exams
2.0	**Cognitive Skills**		
	- The daily life applications of the studied topics. - The most famous and useful instruments build on the studied topics. - How technology is built from simple to advanced present states - some interesting topics on solar radiation and their applications in solar energy conversion	- Defining duties for each chapter - Advising students to search on some of the mentioned technologies (in the course) either on the websites or in the library and make reports.	* The interaction during the lectures and discussions * The reports of different asked tasks * Part of the Exams should focus on the understanding
3.0	**Interpersonal Skills & Responsibility**		
	- Collecting the materials of the course -Writing reports - Developing the English language - Thinking in solving problems - Searching on the internet - Dealing with the lectures that the student missed. - Also, the students should know how to do that independently and through discussions with others.	-Learning how to search on the internet and use the library -Learning how to cover missed lectures -Learning how to summarize lectures or to collect materials of the course -Learning how to solve difficulties in learning:	-Through discussions in the lectures -Checking reports -Asking questions -Quizzes and Exams

		solving problems – enhance educational skills -Developing his interest in Science through :(field trips, visits to scientific and research institutes). - Encouraging the student to attend lectures regularly by giving bonus marks for attendance - Giving students tasks and duties - Learning how to write reports: some of them in English language.	
4.0	**Communication, Information Technology, Numerical**		
	- Communication with others: the lecturer – students in the class - Information Technology through: the Internet – the computer skills - Numerical skills through: solving problems- computation – data analysis)	- Advising the students to: help each other in education. -communicating with the lecturer to discuss difficulties. - Asking students to: make search on the internet for some related interesting topics. -writing reports on the computer - Asking for solving some problems and recalculating some examples.	- Discussing reports on: problems solutions - internet searching - Making discussion on some explored points - Exams
5.0	**Psychomotor**		
	Not applicable	Not applicable	Not applicable

5. Schedule of Assessment Tasks 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	Weekly Homework assignments		10%
2	Attendance and Participation in the class		5%
3	First Mid-term exam	6th week	20%
4	Second Mid-term exam	10th week	25%

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)

- Office hours 2 hr/ week

E Learning Resources

1. List Required Textbooks

1- A. Ghassemi., "SOLAR RADIATION: Practical Modeling for Renewable Energy Applications", (2013).

2- F. Vignola, J. Michalsky, T. Stoffel, "Solar and Infrared Radiation Measurements (Energy and Environment)"; 1st Ed. (2012).

3- Michael E. Mackay, "Solar Energy: An Introduction"; 1st Ed. (2015).

4- Z. Jagoo, "Tracking Solar Concentrators: A Low Budget Solution", (2013).

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

[1] M.A. Rahman, M. Almazroui, M.N. Islam, E. O'Brien, A.E. Yousef, The role of land surface fluxes in Saudi-KAU AGCM: Temperature climatology over the Arabian Peninsula for the period 1981–2010, Atmospheric Research, 200 (2018) 139-152.

[2] A.Z. Sahin, S. Rehman, F. Al-Sulaiman, Global solar radiation and energy yield estimation from photovoltaic power plants for small loads, International Journal of Green Energy, 14 (2017) 490-498.

[3] A. Marzo, M. Trigo-Gonzalez, J. Alonso-Montesinos, M. Martínez-Durbán, G. López, P. Ferrada, E. Fuentealba, M. Cortés, F. Batlles, Daily global solar radiation estimation in desert areas using daily extreme temperatures and extraterrestrial radiation, Renewable Energy, 113 (2017) 303-311.

[4] A. El-Sebaii, F. Al-Hazmi, A. Al-Ghamdi, S.J. Yaghmour, Global, direct and diffuse solar radiation on horizontal and tilted surfaces in Jeddah, Saudi Arabia, Applied Energy, 87 (2010) 568-576.

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

Websites on the internet that are relevant to the course topics

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

Multimedia associated with the text book and the relevant websites

F. Facilities Required

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

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

- Computer room containing at least 15 systems
- Scientific calculator for each student.

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

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching • Course evaluation by student • Students- faculty meetings
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Peer consultation on teaching • Departmental council discussions • Discussions within the group of faculty teaching the course
3. Processes for Improvement of Teaching • Conducting workshops given by experts on the teaching and learning Methodologies. • Periodical departmental revisions of methods of teaching. • Monitoring of teaching activates by senior faculty members.
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) • Providing samples of all kinds of assessments in the departmental course portfolio of each course • Assigning group of faculty members teaching the same course to grade same questions for various students. • Faculty members from other institutions are invited to review the accuracy of the grading policy.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • The course material and learning outcomes are periodically reviewed and the changes to be taken are approved in the departmental meetings and higher councils. • The head of department and faculty dean take the responsibility of implementing the proposed changes.

Name of Course Instructor: **Dr. Samah El-Bashir**
Signature: _____ Date Specification Completed: **1-1-2018**

Program Coordinator: _____

Signature: _____ Date Received: _____