SEE8127 Nanotechnology in Energy and Environment

Course Title: Nanotechnology in Energy and Environment
Course Code: SEE8127
Course Duration: 1 semester
Credit Units: 3
Level: R8
Medium of Instruction: English
Prerequisites: N/A
Precursors: N/A
Equivalent Courses: NA
Exclusive Courses:) NA

Course Aims

The course aims to impart the fundamental knowledge in nanoscience in the context of the advancement of Nanotechnology in Energy and Environmental applications. Through this course students are taught the different aspects of Nanotechnology and the bridging of multidisciplinary knowledge. Specific areas to be covered in this course include nanocatalysis, solar photovoltaic, photoelectrochemical conversion, energy storage, pollutants sensing, and photocatalytic abatement of air and water.

Course Intended Learning Outcomes (CILOs)

(state what the student is expected to be able to do at the end of the course according to a given standard of performance)

Upon successful completion of this course, students should be able to:

No.	CILOs	Weighting (if applicable)
1.	Identify the urgency of energy and environmental solutions and the expectations of Nanotechnology in providing long term solutions to these problems	1
2.	Describe the concepts of heterogeneous catalysis, and further apply in the designing of various nanocatalysts for energy and environmental applications	2.5
3.	Apply Nanotechnology and nanomaterials in the designing of solar energy conversion systems and fuel cell technologies	2.5
4.	Describe the application of Nanotechnology and nanomaterials in energy storage technologies	1
5.	Apply Nanotechnology in the sensing and remediation of pollutants in air and water	3.0

Teaching and Learning Activities (TLAs)

(Indicative of likely activities and tasks designed to facilitate students' achievement of the CILOs. Final details will be provided to students in their first week of attendance in this course)

CILO No.	TLAs	Hours/week (if applicable)
CILO 1	Lecture, tutorials	3
CILO 2	Lectures, tutorials, lab-based experiments	3
CILO 3	Lectures, tutorials, lab-based experiments	3
CILO 4	Lectures, tutorials	3
CILO 5	Lectures, tutorials, lab-based experiments	3

Assessment Tasks/Activities

(Indicative of likely activities and tasks designed to assess how well the students achieve the CILOs. Final details will be provided to students in their first week of attendance in this course)

CILO No.	Type of Assessment Tasks/Activities	Weighting (if applicable)	Remarks
CILO 1	Assignment (10%)	10%	
CILO 2	Assignment (5%), lab report (20%)	25%	
CILO 3	Assignment (5%), lab report (20%)	25%	
CILO 4	Assignment (10%)	10%	
CILO 5	Assignment (5%), lab report (20%), oral presentation (5%)	30%	

Coursework: 100%

Grading of Student Achievement:

Refer to Grading of Courses in the Academic Regulations (Attachment) and to the Explanatory Notes.

Letter Grade	Grade Definitions	
A+ A A-	Excellent:	Strong evidence of extensive knowledge in basic Nanotechnology; strong capacity to apply creative Nanotechnology to solve energy and environmental problems.
B+ B B-	Good:	Some evidence of analytic ability to apply Nanotechnology to solve energy related problems; reasonable understanding of nanomaterial properties; evidence of familiarity with applications of Nanotechnology in energy and environmental problems.
C+ C C-	Adequate:	Understanding of some fundamentals of basic Nanotechnology; ability to apply Nanotechnology to develop solutions to simple energy and environmental problems.
D	Marginal:	Sufficient familiarity with basic Nanotechnology related to energy and environmental solutions.
F	Failure:	Little evidence of familiarity with the subject matter.

Keyword Syllabus

Nanocatalysis, solar photovoltaic, photoelectrochemical cells, fuel cells, nanosensors, Li-ion batteries, supercapacitor, photocatalysis for remediation of air and water

Recommended Reading
Text(s)

Wilson, M., Kannangara, K., Raguse, B., Simmon, M. (2002) Nanotechnology: Basic Science and Emerging Technologies, Chapman and Hall/CRC

Garcia-Martinez, J. (2010) Nanotechnology for the Energy Challenge, Wiley-VCH

Somorjai, G.A., Frei, H., Park, J.Y. Advancing the frontiers in nanocatalysis, biointerfaces and renewable energy conversion by innovations of surface techniques, *J. Am. Chem. Soc.*, **2009**, *131*, 16589.

Kamat, P.V. Meeting the clean energy demand. Nanostructure architectures for solar energy conversion, *J. Phys. Chem. C*, **2007**, *111*, 2834.