MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Introduction to Renewable Energy**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**RAC 402**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	four		**Semester of Delivery**	Seven	
Administering Department	PM		**College**	TEMO	
Module Leader	Asmaa taha hussen		**e-mail**	asmaa.taha@ntu.edu.iq	
Module Leader's Acad. Title	Assist. Lecturer		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	1/6/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The main purpose of this course is to introduce students with renewable energy resources availability, potential and suitability as a substitute for conventional energy resources in future energy demand. Having completed the courses, the student should have Knowledge. Advanced knowledge about different renewable energy resources.Advanced knowledge about potential of using renewable energy technologies as a complement to and to the extent possible, replacement for conventional technologies, and possibilities to combine renewable and non-renewable energy technologies in hybrid systems. Knowledge about strategies for enhancing the use of renewable energy resources for future demand. Skills, Analysis on importance of renewable energy solutions for sustainable development.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Explain about the types of introductions in renewable energy resources 2. To make the students understand the working of turbines, and pumps. 3. To make the students understand the operational principle of renewable energy resources. 4. To make the students understanding all about the geothermal, biomass energies 5. To explain the Pumps, Kinds of Pumps 6. Explain the operation of Pumps in series and Parallel, Centrifugal pumps 7. To help students how to calculate gas Turbines, Impulse Turbine.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Introduction to renewable energy resources, solar energy, wind energy. [15 hrs] Introduction to renewable energy resources, Hydro-electric power plants [15 hrs]

	Geothermal energy power plants technology [10 hrs] Biomass energy, different resources of biomass materials [15 hrs] Part B – Fundamentals - To understand the modern technologies of renewable energy [15 hrs] - Ability to design different types of turbines and compressors [7 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Type something like: The major approach used to offer this module will be to promote student engagement in the exercises while also enhancing and broadening their critical thinking abilities. This will be accomplished through lectures, interactive tutorials, and the consideration of various sorts of easy experiments incorporating some engaging sampling exercises for the students.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	3,9,10 and 12	LO #1, #2,#3,#4,#5#6 and #7
	Assignments	6	10% (10)	2,4,5,8 ,10 and 14	LO #2, #3,#4,#5, and #6, #7
	Projects / Lab.	11	20% (20)	Continuous	All
	Report				
Summative assessment	**Midterm Exam**	3hr	10% (10)	7	LO #1 - #4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Traditional energy resources**
Week 2	**Renewable energy, definition and Resources**
Week 3	**Solar energy, solar constant, and Solar radiation at earth`s surface**
Week 4	**Solar angles and solar time**
Week 5	**Global Radiation (Beam and Diffuse) Radiation Components**
Week 6	**Flat plate Solar collector**
Week 7	**Evacuated Tube Collector**
Week 8	**Applications of solar Energy**

Week 9	**Hydro-electric power plant**
Week 10	**Types of Hydraulic Turbines**
Week 11	**Introduction to Wind turbines**
Week 12	**Classification of Wind Turbines**
Week 13	**Introduction to Geothermal Energy**
Week 14	**Ocean Energy Conversion Technologies (Waves, Currents, and Tides)**
Week 15	**Biomass Energy Resources**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	**Estimating the useful heat or heat gain using solar water heater**
Week 2	**Estimating the useful heat or heat gain using solar air heater**
Week 3	**Estimating the amount of Distilled water using solar distillation unit**
Week 4	**Estimating the useful heat or heat gain using solar chimeny device**
Week 5	**Kaplan turbine rig test**
Week 6	**Pelton turbine rig test**
Week 7	**zero-head turbine**
Week 8	**Open channel with zero head flow turbine rig test (ocaen wave generator)**

Week 9	**Photovoltaic power generation rig-part 1**
Week 10	**biomass energy**
Week 11	**power cell experiment**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Solar Engineering of Thermal Processes 3rd Edition, 2006	No
Recommended Texts	Solar Energy Engineering Processes and Systems Second Edition, 2014	No
Websites	https://www.linquip.com/ Linquip Content Management Team	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** – Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D – Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E – Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Code	Course/Module Title	ECTS	Semester
RAC 402	Introduction to Renewable Energy	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/sem)**
2	2	63	87

Description

A course on Introduction to renewable energy. Includes the following sections:
1. demonstrate an ability to use critical thinking and problem-solving skills to evaluate business energy use and how and when to apply renewable energy solutions
2. demonstrate an understanding of, and assess the obstacles associated with implementation of renewable energy systems
3. evaluate the advantages, limitations and potential of various clean energy sources for buildings and businesses
4. demonstrate an understanding and familiarity with engineering and financial aspects of projects
5. demonstrate an understanding and familiarity with the regulatory aspects of renewable energy projects
6. demonstrate an understanding and familiarity with the State policies, financing and utility-led programs in CT.