جامعة البحرين
University of Bahrain
مركز ضمان الجودة والاعتماد الأكاديمي
Quality Assurance and Accreditation Center

Academic Course Specification Form

استمارة توصيف المقرر الأكاديمي

القسم الخاص بالطالب
Section Concerning the Student

1. Course Code:	CHEMY 353	**1. رمز المقرر:**
2. Course Title	Principles and Applications of Green Chemistry	**2. اسم المقرر:**
3. College:	Science	**3. الكلية:**
4. Department:	Chemistry	**4. القسم:**
5. Academic Program:	Bachelor of Science in Chemistry	**5. البرنامج الأكاديمي:**
6. Course Credits:	2-2-3	**6. عدد الساعات المعتمدة:**
7. Course NQF Level:	8	**7. مستوى المقرر وفقا للإطار الوطني للمؤهلات:**
8. Notional Hours:	118	**8. عدد الساعات الافتراضية:**
9. NQF Credits:	12	**9. عدد الساعات المعتمدة للمقرر وفقا للإطار الوطني للمؤهلات:**
10. Prerequisite:	CHEMY 321	**10. المتطلب السابق للمقرر:**
11. Lectures Timing & Location:		**11. وقت المحاضرة ومكانها:**
12. General Mode of Teaching and Learning	Traditional تقليدي	**12. النمط العام للتعليم والتعلّم:**

13. Course Coordinator:		**13. منسّق المقرر:**
14. Course Instructor:		**14. مدرّس المقرر:**
15. Office Hours and Location:		**15. الساعات المكتبية ومكانها:**
16. Instructor's Email:		**16. البريد الإلكتروني لمدرّس المقرر:**
17. Academic Year:		**17. السنة الأكاديمية:**
18. Semester:		**18. الفصل الدراسي:**

19. Textbook(s):	**19. الكتب الدراسية للمقرر:**
Green Chemistry: An Introductory Text, Mike Lancaster, RSC, 2002.	
20. References:	**20. المراجع:**
Green Chemistry: Designing Chemistry for the Environment, P.T. Anstas and T.C. Willamson(editors), ACS, 1996. An Introduction to Green Chemistry, Matlack, Marcel & Deckker, 2001. Handbook of Green Chemistry and Technology. Clark & (edits.). Blackwell, 2002 Green Solvents for Chemistry, Nelson, OUP, 2003 Etzkorn, F.A., 2019. Green chemistry: Principles and case studies. Royal Society of Chemistry.	
21. Other Learning Resources Used (e.g. e-learning, field visits, periodicals, software, etc.):	**21. مصادر التعلّم الأخرى (مثال: التعلّم الإلكتروني، زيارات ميدانية، دوريات، برمجيات، إلخ....)**
Field visits, periodicals (ACS/Nature, Science etc.)	
22. Course Description (as published in the College Catalogue):	**22. توصيف المقرر (حسب ما ورد في دليل الكلية):**
Introduction to green chemistry principles; solving some environmental problems regarding industrial waste generation; the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances; controlling environmental pollution in atmosphere from management point of view and Life Cycle Assessment (LCA) and its application will also be dealt with as a case study. Related practical work.	
23. Course Intended Learning Outcomes (3 to 5 CILOs):	**23. مخرجات التعلّم للمقرر (CILOs) (3 إلى 5 مخرجات تعلّمية):**
1. Identify the applied principles of green chemistry in the field of chemical industry	
2. Assess the use of renewable raw materials for the processes to minimize chemical waste	
3. Critically compare the advantages of alternative solvents including water, ionic liquids, and supercritical media	
4. Identify the economic, social, and environmental effects of green and non-green chemical processes.	

5. Use special skills to design appropriate processes to synthesize various green organic chemicals from various raw materials	

24. Course Assessment Percentages (as per Regulations of Study and Examination at the University of Bahrain):		**24. أساليب التقييم ونسبها المئوية (بحسب نظام الدراسة والامتحانات في جامعة البحرين):**	
Assessment **التقييم**	**Type** **النوع**	**Percentage** **النسبة**	**Assessment Date** **تاريخ التقييم**
Quizzes	Individual فردي	10%	
2 Tests	Individual فردي	30%	
Laboratory/Practical	Individual فردي	10%	
Projects/Case Studies	Individual فردي	5%	
Final Examination	Individual فردي	40%	
Total	**100%**		

25. Description of Topics Covered	**25. وصف الموضوعات التي ينبغي تناولها:**
Topic Title ***(e.g. chapter/experiment title)*** **الموضوع**	*Description* التفصيل
CH 1: Principles and Concepts of Green Chemistry	This chapter describes introduction to green chemistry, principles and concepts of green chemistry, sustainable development and green chemistry, atom economy, atom economic reactions and atom un-economic reactions
CH 2: Waste: Production, Problems and Prevention	This chapter includes introduction to waste: production, some problems caused by waste, sources of waste from the chemical industry, prevention, and waste minimization techniques/treatment
CH 3: Measuring and Controlling Environmental Performance	This chapter explains measuring and Controlling Environmental Performance, The Importance of Measurement, Environmental Management Systems and Integrated Pollution Prevention and Control
CH 4: Catalysis and Green Chemistry	This chapter includes introduction to catalysis and green chemistry, introduction to catalysis, comparison of catalyst types
CH 5: Organic Solvents: Environmentally Benign Solutions	This chapter describes organic solvents: environmentally benign solutions, organic solvents, volatile organic compounds, supercritical fluids, and ionic liquids
CH 6: Renewable Resources	This chapter explains renewable resources, biomass as a renewable resource, energy, forms of renewable energy and chemicals from renewable feedstocks

CH 7: Emerging Greener Technologies and Alternative Energy Sources	This chapter explains emerging greener technologies and alternative energy sources, design for energy efficiency, photochemical reactions, chemistry using microwaves, sonochemistry and electrochemical synthesis
CH 8: Designing Greener Processes	This chapter explains designing greener processes, conventional reactors, inherently safer design, and in-process monitoring
CH 9: Industrial Case Studies	This chapter describe industrial case studies, greening of acetic acid manufacture, vitamin c, radical process, Ziegler–Natta catalysis, and eco-friendly pesticides
CH 10: The Future's Green: An Integrated Approach to a Greener Chemical Industry	This chapter explains the future's green: an integrated approach to a greener chemical industry, society and sustainability, barriers and drivers, the role of legislation and green chemical supply strategies

26. Weekly Schedule **26. الجدول الأسبوعي**

Week الأسبوع	Date التاريخ	Topics Covered الموضوعات المتناولة	CILOs مخرجات التعلُم للمقرر (CILOs)	Teaching/Assessment Mode and Method منهجية ونمط التدريس/التقييم
1		Principles & Concepts of Green Chemistry	1,2,3,4,5	Tranditional تقليدي
2		Twelve Principles of Green Chemistry	1,2,3,4,5	Tranditional تقليدي
3		Atom Economic Reaction	1,2,3,4,5	Tranditional تقليدي
4		Atom uneconomic Reaction	1,2,3,4,5	Tranditional تقليدي
5		Waste: Production, Problems& Prevention	1,2,3,4,5	Tranditional تقليدي
6		Waste Minimization Techniques	1,2,3,4,5	Tranditional تقليدي
7		On-Site Treatment of Waste & Design for Degradation	1,2,3,4,5	Tranditional تقليدي
8		Environmental Metrics and Control: EMS	1,2,3,4,5	Tranditional تقليدي
9		Catalysis and Green Chemistry	1,2,3,4,5	Tranditional تقليدي
10		Organic Benign Solvents (green Solvents)	1,2,3,4,5	Tranditional تقليدي
11		Renewable Resource	1,2,3,4,5	Tranditional تقليدي
12		Designing Greener Processes	1,2,3,4,5	Tranditional تقليدي

13		Integrated Approach to Greener Industries	1,2,3,4,5	Tranditional تقليدي
14		Industrial Case Studies	1,2,3,4,5	Tranditional تقليدي
15		Industrial Case Studies	4	Tranditional تقليدي
16				

27. Academic Integrity Statement	**27. بيان النزاهة الأكاديمية**
Students are to observe the highest level of honesty and academic ethics in pursuit of their academic goals as per UOB Regulations of Student Conduct and Academic Integrity, Anti-plagiarism Policies, and Students' Rights and Responsibilities Handbook. The consequences for cheating, plagiarism, unauthorized collaboration, and other forms of academic dishonesty can be very serious and will be dealt with as per the aforementioned policies and regulations.	يعتبر الصدق والنزاهة عنصران أساسيان في العملية الأكاديمية. حيث يُتوقع من الطلاب خلال سعيهم لتحقيق أهدافهم الأكاديمية التحلي بالأمانة والأخلاق في جميع الأوقات، وذلك وفقًا للوائح والأنظمة الخاصة بطلبة جامعة البحرين، بالإضافة إلى دليل حقوق الطلبة وواجباتهم، وكما جاء في سياسة الانتحال الخاصة بجامعة البحرين. حيث سيتم التعامل مع أي انتهاك للنزاهة الأكاديمية بحسب ما تنص عليه السياسات والأنظمة السابق ذكرها.
28. Attendance and Absence Regulations	**28. نظام الحضور والغياب**
Students are required to adhere to regular attendance for class lectures and practical sessions, as determined by the nature of the course, as per Article (33), of Regulations of Study and Examination at the University of Bahrain.	يُتوقع من الطلاب الالتزام بالحضور المنتظم للساعات الصفية والعملية بحسب طبيعة المقرر، وفقًا للمادة (33)، من نظام الدراسة والامتحانات في جامعة البحرين.