# **Kingdom of Saudi Arabia**

### The National Commission for

Academic Accreditation & Assessment





# **Course Specifications**

# **Chemistry of Natural Products 402335**



**Course Specifications** 

| Institution: Umm Al-Qura University | Date of Report: 2015 |
|-------------------------------------|----------------------|
|-------------------------------------|----------------------|

College/Department : Faculty of Applied Science/ department of chemistry

#### A. Course Identification and General Information

- 1. Course title and code: Chemistry of Natural Products/ 402335
- 2. Credit hours: 2 (2+0)
- 3. Program(s) in which the course is offered. **Chemistry program**
- 4. Name of faculty member responsible for the course: **Doctor Nizar El Guesmi**
- 5. Level/year at which this course is offered: 6<sup>th</sup> level / 3<sup>rd</sup> year
- 6. Pre-requisites for this course (if any): Chemistry of Heterocyclic Compounds/ 402333
- 7. Co-requisites for this course (if any)---

| 8. | Location if not on main campus: both on El-Abedyah, and El-Zaher |
|----|--|
| 9. | Mode of Instruction (mark all that apply)                        |

| a. Traditional classroom            | What percentage? |      |
|-------------------------------------|------------------|------|
| b. Blended (traditional and online) | What percentage? | 100% |
| 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?

By the end of this course student will be familiar with nomenclature, structure elucidation, general properties and methods of preparation of natural products

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)

The students will be mentioned to prepare an essay or a report from literature using the library, data base services, and/or websites to follow up and update the new topics of the subject of the course

**C.** Course Description (Note: General description in the form to be used for the Bulletin or handbook should be attached)

| 1. Topics to be Covered  |                 |                          |  |  |
|--|-----------------|--------------------------|--|--|
| List of Topics   | No. of<br>Weeks | Cont<br>act<br>Hour<br>s |  |  |
| <ul> <li>a. Definition, classification, nomenclature and Identification of natural products: Terpenoids – Steroids – Alkaloids – Carotenoids – Anthocyanins – Vitamins.</li> </ul>   | 2               | 4                        |  |  |
| <ul> <li>b. Terpenoids : Introduction and isolation from plants – general structure<br/>and nomenclature – classification – general methods of determination of<br/>the structure and preparations.</li> </ul>   | 3               | 6                        |  |  |
| <ul> <li>c. Steroids : Introduction and their natural abundance – the difference<br/>between steroid compounds – nomenclature – structure elucidation of<br/>steroids (sterols – cholesterol – Ergosterol – bile acids – Oestrogens –<br/>androges – Testesterone – and Progesterone) – methods of preparation<br/>of steroids.</li> </ul> | 2               | 4                        |  |  |
| <ul> <li>d. Alkaloids : Introduction and methods of extractions – general properties</li> <li>– classification of alkaloids (adrenaline – Ephedrine – papaverine – morphine – heroin – tropane – atropine – cocaine) – structure elucidation of alkaloids and methods of preparation.</li> </ul>   | 2               | 4                        |  |  |
| e. Carotenoids : Introduction and types – methods of isolation and preparation.  | 1               | 2                        |  |  |
| f. Anthocyanins : general properties – methods of isolation and preparation.   | 1               | 2                        |  |  |
| g. Vitamins : Introduction and importance – classification – Examples of some vitamins and their structures and its methods of preparation.  | 1               | 2                        |  |  |
| Practical Part:  |                 |                          |  |  |



#### NOT APPLICABLE

| 2. Course components (total contact hours and credits per semester): |         |          |            |           |        |       |
|--|---------|----------|------------|-----------|--------|-------|
|  | Lecture | Tutorial | Laboratory | Practical | Other: | Total |
| Contact<br>Hours   | 24      | -        | -          | -         | -      | 24    |
| Credit   | 2       | -        | -          | -         | -      | 2     |

3. Additional private study/learning hours expected for students per week. ~4 Hours

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

| NQF Learning Domains<br>And Course Learning OutcomesCourse<br>Teaching<br>StrategiesCourse<br>Assessment<br>Methods1.0Knowledge• Lectures<br>• Scientific• Exams1.1Recognize the natural abundance of natural products<br>products• Lectures<br>• Scientific• Exams1.3Know the methods of isolation from plants of natural<br>products• Lectures<br>• Scientific• Exams1.4Describe the different methods of extraction of the natural<br>products• Uibrary<br>visits• Web-based<br>student1.4Describe the different method of elucidation of structure• Web-based<br>study• Optifolios1.5Familiar with the general properties of different natural<br>products and their relation with the structure• Web-based<br>study• Doptifolios1.6Select the proper method of elucidation of structure of an<br>natural products• Nemorize is the importance of natural products and their<br>impact on the human body• Dopties and their<br>structure• Dopties and their<br>structure1.10Memorize different name natural products with general<br>structure• Lectures<br>• Scientific• Exams2.0Cognitive Skills• Lectures<br>• Scientific<br>discussion<br>• Library• Exams<br>• web-based<br>student2.1Compare each class of natural products through its<br>structure• Lectures<br>• Scientific<br>discussion<br>• Library• Exams<br>• Scientific<br>discussion<br>• Library2.2Explain the different strategies for preparation of natural<br>products• Library<br>• Library• Exams<br>• Scientific<br>discussion<br>• Library< |      | NOFI : D :   | C   | C                              |
|--|------|--|---|--------------------------------|
| Indext Normal StrategiesMethods1.0Knowledge• Lectures1.1Recognize the natural abundance of natural products• Lectures1.2Name different natural products classes• Scientific1.3Know the methods of isolation from plants of natural<br>products• Lectures1.4Describe the different methods of extraction of the natural<br>products• Uibrary1.4Describe the different methods of extraction of the natural<br>products and their relation with the structure• Web-based1.5Familiar with the general properties of different natural<br>products and their relation with the structure• Web-based1.6Select the proper method of elucidation of structure of an<br>natural products• Web-based1.7Identify the natural products• Web-based1.8Write a mechanism for a natural product s and their<br>impact on the human body• Web-based1.10Memorize different name natural products with general<br>structure• Lectures1.11Outline the different uses of natural products through its<br>structure• Lectures2.1Compare each class of natural products through its<br>structure• Lectures2.2Explain the different strategies for preparation of natural<br>products• Lectures2.3Analyze the reasons for the unique properties in some• Lectures   |      | NQF Learning Domains<br>And Course Learning Outcomes   | Course<br>Teaching                            | Course<br>Assessment           |
| 1.0Knowledge1.1Recognize the natural abundance of natural products• Lectures1.2Name different natural products classes• Scientific<br>discussion• Exams1.3Know the methods of isolation from plants of natural<br>products• Lectures• Web-based<br>student1.4Describe the different methods of extraction of the natural<br>products• Library• Web-based1.5Familiar with the general properties of different natural<br>products and their relation with the structure• Web-based• Dong and<br>short essays1.6Select the proper method of elucidation of structure of an<br>natural products• Web-based• Dong and<br>short essays1.7Identify the natural products• Dong and<br>short essays• Dosters lab<br>   |      | 0  | Strategies                                    | Methods                        |
| 1.1Recognize the natural abundance of natural products• Lectures• Exams1.2Name different natural products classes• Scientific<br>discussion• Web-based<br>student• Web-based<br>student1.3Know the methods of isolation from plants of natural<br>products• Library<br>visits• Web-based<br>systems1.4Describe the different methods of extraction of the natural<br>products and their relation with the structure• Web-based<br>study• Web-based<br>systems1.5Familiar with the general properties of different natural<br>products and their relation with the structure• Web-based<br>study• Dog and<br>short essays1.6Select the proper method of elucidation of structure of an<br>natural products• Meboased<br>study• Dog and<br>short essays1.7Identify the natural productsmanuals• Dostributed<br>short essays• Dostributed<br>short essays1.10Memorize different name natural products with general<br>structure• Lictures<br>structure• Exams<br>scientific<br>discussion2.1Compare each class of natural products through its<br>structure• Lectures<br>scientific<br>discussion• Exams<br>eveb-based<br>student2.2Explain the different strategies for preparation of natural<br>products• Lectures<br>scientific<br>discussion• Exams<br>eveb-based<br>student2.3Analyze the reasons for the unique properties in some• Library• Exams   | 1.0  | Knowledge  |   |                                |
| 1.2Name different natural products classes• Scientific<br>discussion• web-based<br>student<br>performance1.3Know the methods of isolation from plants of natural<br>products• Scientific<br>discussion• web-based<br>student<br>performance1.4Describe the different methods of extraction of the natural<br>products• Library<br>visits• Web-based<br>systems1.5Familiar with the general properties of different natural<br>products and their relation with the structure• Web-based<br>study• Web-based<br>study1.6Select the proper method of elucidation of structure of an<br>natural products• Web-based<br>study• Dosters lab<br>manuals1.7Identify the natural products• Memorize different name natural products and their<br>impact on the human body• Dosters• Dosters1.10Memorize different uses of natural products• Library• Scientific<br>discussion• Exams2.1Compare each class of natural products through its<br>structure• Library• Exams2.2Explain the different strategies for preparation of natural<br>products• Library• Exams2.3Analyze the reasons for the unique properties in some• Library  | 1.1  | Recognize the natural abundance of natural products  | • Lectures                                    | • Exams                        |
| 1.3Know the methods of isolation from plants of natural<br>productsdiscussionstudent<br>performance<br>systems1.4Describe the different methods of extraction of the natural<br>productsLibrary<br>visitsstudent<br>performance<br>systems1.5Familiar with the general properties of different natural<br>products and their relation with the structure•Web-based<br>study•Describe<br>ists•Describe<br>optical<br>study1.6Select the proper method of elucidation of structure of an<br>natural products•Wetb-based<br>study•Describe<br>ists•Describe<br>ists•Describe<br>study1.7Identify the natural productsIdentify the natural products•Describe<br>impact on the human body•Describe<br>impact on the human body•Describe<br>impact on the human body•Describe<br>impact on the human body•Describe<br>impact on the human body1.10Memorize different name natural products with general<br>structure•Lectures<br>•Scientific<br>discussion•Exams<br>•web-based<br>student2.1Compare each class of natural products through its<br>structure•Lectures<br>•Scientific<br>discussion•Exams<br>•web-based<br>student2.2Explain the different strategies for preparation of natural<br>products•Library•Exams<br>•web-based<br>student2.3Analyze the reasons for the unique properties in some•Library•Exams<br>•Library  | 1.2  | Name different natural products classes  | <ul> <li>Scientific</li> </ul>                | • web-based                    |
| products• Libraryperformance1.4Describe the different methods of extraction of the natural<br>products• Libraryperformance1.5Familiar with the general properties of different natural<br>products and their relation with the structure• Web-based• Dong and<br>short essays1.6Select the proper method of elucidation of structure of an<br>natural products• Web-based• Dong and<br>short essays1.7Identify the natural products• Describe the importance of natural products and their<br>impact on the human body• Dong• Dong1.10Memorize different name natural productsmanual products• Describe the structure• Dong1.11Outline the different uses of natural products• Uectures• Exams2.1Compare each class of natural products through its<br>structure• Lectures• Exams2.2Explain the different strategies for preparation of natural<br>products• Library• Exams2.3Analyze the reasons for the unique properties in some• Library   | 1.3  | Know the methods of isolation from plants of natural   | discussion                                    | student                        |
| 1.4Describe the different methods of extraction of the natural<br>productsvisitssystems1.5Familiar with the general properties of different natural<br>products and their relation with the structure• Web-based<br>study• long and<br>short essays1.6Select the proper method of elucidation of structure of an<br>natural products• web-based• posters lab<br>manuals1.7Identify the natural products• manuals• posters lab<br>manuals1.8Write a mechanism for a natural product transformation• manuals1.9Recognize the importance of natural products with general<br>structure• end•   |      | products   | <ul> <li>Library</li> </ul>                   | performance                    |
| products• Web-based<br>study• Optifolios1.5Familiar with the general properties of different natural<br>products and their relation with the structure• Web-based<br>study• Iong and<br>short essays1.6Select the proper method of elucidation of structure of an<br>natural products• posters lab<br>manuals1.7Identify the natural products• posters1.8Write a mechanism for a natural product transformation• posters1.9Recognize the importance of natural products and their<br>impact on the human body• intervent1.10Memorize different name natural products with general<br>structure• Lectures1.11Outline the different uses of natural products through its<br>structure• Lectures<br>• Scientific<br>discussion• Exams<br>• web-based<br>student2.1Compare each class of natural products through its<br>products• Lectures<br>• Scientific<br>discussion<br>• Library• Exams<br>• web-based<br>student<br>performance2.3Analyze the reasons for the unique properties in some• Lectures<br>• Library• Exams<br>• Library  | 1.4  | Describe the different methods of extraction of the natural  | visits  | systems                        |
| 1.5Familiar with the general properties of different natural<br>products and their relation with the structurestudy• long and<br>short essays1.6Select the proper method of elucidation of structure of an<br>natural products• long and<br>short essays1.7Identify the natural products• posters lab<br>manuals1.8Write a mechanism for a natural product transformation• long<br>and<br>short essays1.9Recognize the importance of natural products and their<br>impact on the human body• long<br>and<br>structure1.10Memorize different name natural products with general<br>structure• Lectures<br>• Scientific<br>discussion<br>• Library2.1Compare each class of natural products through its<br>structure• Lectures<br>• Scientific<br>discussion<br>• Library2.2Explain the different strategies for preparation of natural<br>products• Lectures<br>• Scientific<br>discussion<br>• Library2.3Analyze the reasons for the unique properties in some• Lectures<br>• Scientific<br>discussion<br>• Library  |      | products   | • Web-based                                   | <ul> <li>portfolios</li> </ul> |
| 1.6Select the proper method of elucidation of structure of an<br>natural products• posters lab<br>manuals1.7Identify the natural products• posters lab<br>manuals1.8Write a mechanism for a natural product transformation• posters lab<br>manuals1.9Recognize the importance of natural products and their<br>impact on the human body• estimate1.10Memorize different name natural products with general<br>structure• estimate1.11Outline the different uses of natural products• estimate2.0Cognitive Skills• Lectures<br>• Scientific<br>discussion<br>• Library2.1Explain the different strategies for preparation of natural<br>products• Lectures<br>• Scientific<br>discussion<br>• Library2.3Analyze the reasons for the unique properties in some• Lectures<br>• Scientific<br>discussion<br>• Library  | 1.5  | Familiar with the general properties of different natural products and their relation with the structure | study   | • long and short essays        |
| 1.7Identify the natural products1.8Write a mechanism for a natural product transformation1.9Recognize the importance of natural products and their<br>impact on the human body1.10Memorize different name natural products with general<br>structure1.11Outline the different uses of natural products1.11Outline the different uses of natural products2.0Cognitive Skills2.1Compare each class of natural products through its<br>structure2.2Explain the different strategies for preparation of natural<br>products2.3Analyze the reasons for the unique properties in some  | 1.6  | Select the proper method of elucidation of structure of an natural products                              |   | • posters lab manuals          |
| 1.8Write a mechanism for a natural product transformation1.9Recognize the importance of natural products and their<br>impact on the human body1.10Memorize different name natural products with general<br>structure1.11Outline the different uses of natural products2.0Cognitive Skills2.1Compare each class of natural products through its<br>structure2.2Explain the different strategies for preparation of natural<br>products2.3Analyze the reasons for the unique properties in some  | 1.7  | Identify the natural products  |   |                                |
| 1.9Recognize the importance of natural products and their<br>impact on the human bodyImpact on the human body1.10Memorize different name natural products with general<br>structureImpact on the human body1.11Outline the different uses of natural productsImpact on the human body2.0Cognitive SkillsImpact on the different uses of natural products through its<br>structure2.1Compare each class of natural products through its<br>structureImpact on the different strategies for preparation of natural<br>products2.2Explain the different strategies for preparation of natural<br>productsImpact on the unique properties in some2.3Analyze the reasons for the unique properties in someImpact on the unique properties in some   | 1.8  | Write a mechanism for a natural product transformation   |   |                                |
| 1.10Memorize different name natural products with general<br>structure1.11Outline the different uses of natural products2.0Cognitive Skills2.1Compare each class of natural products through its<br>structure2.2Explain the different strategies for preparation of natural<br>products2.3Analyze the reasons for the unique properties in some  | 1.9  | Recognize the importance of natural products and their impact on the human body                          |   |                                |
| 1.11Outline the different uses of natural products2.0Cognitive Skills2.1Compare each class of natural products through its<br>structure• Lectures<br>• Scientific<br>discussion<br>• Library2.2Explain the different strategies for preparation of natural<br>products• Lectures<br>• Scientific<br>discussion<br>• Library2.3Analyze the reasons for the unique properties in some• Lectures<br>• Scientific<br>discussion<br>• Library   | 1.10 | Memorize different name natural products with general structure  |   |                                |
| 2.0Cognitive Skills2.1Compare each class of natural products through its<br>structure• Lectures<br>• Scientific<br>discussion<br>• Library• Exams<br>• web-based<br>student<br>performance2.2Explain the different strategies for preparation of natural<br>products• Lectures<br>• Scientific<br>discussion<br>• Library• Exams<br>• web-based<br>student<br>performance2.3Analyze the reasons for the unique properties in some• Lectures<br>• Scientific<br>discussion<br>• Library   | 1.11 | Outline the different uses of natural products   |   |                                |
| 2.1Compare each class of natural products through its<br>structure• Lectures<br>• Scientific<br>discussion<br>• Library• Exams<br>• Web-based<br>student<br>performance2.2Explain the different strategies for preparation of natural<br>products• Lectures<br>• Scientific<br>discussion<br>• Library• Exams<br>• Web-based<br>student<br>performance2.3Analyze the reasons for the unique properties in some• Lectures<br>• Scientific<br>discussion<br>• Library  | 2.0  | Cognitive Skills   |   |                                |
| 2.2Explain the different strategies for preparation of natural<br>productsdiscussion<br>•Librarystudent<br>performance2.3Analyze the reasons for the unique properties in some   | 2.1  | Compare each class of natural products through its structure   | <ul><li>Lectures</li><li>Scientific</li></ul> | • Exams<br>• web-based         |
| 2.3 Analyze the reasons for the unique properties in some  | 2.2  | Explain the different strategies for preparation of natural products                                     | discussion<br>• Library                       | student performance            |
|  | 2.3  | Analyze the reasons for the unique properties in some  | -   |                                |





|     | natural products  | visits  | systems  |
|-----|---|---|--|
| 2.4 | Predict the benefits and harms of various natural products                      | • Web-based   | <ul> <li>portfolios</li> </ul>   |
| 2.5 | Summarize the different methods for the preparation of various natural products | study   | <ul> <li>posters</li> <li>demonstrations</li> </ul>  |
| 3.0 | Interpersonal Skills & Responsibility   |   |  |
| 3.1 | Use the adequate method of isolation from plants of natural products            | <ul> <li>Lectures</li> <li>Scientific discussion</li> </ul> | <ul> <li>Exams</li> <li>web-based<br/>student</li> </ul>   |
| 3.2 | Choose the natural product class for a given structure                          | • Web-based study   | performance<br>systems   |
| 4.0 | Communication, Information Technology, Numerical                                |   |  |
| 4.1 | Evaluate the different methods of preparation of natural products               | <ul><li>Lectures</li><li>Scientific</li></ul>               | • web-based student  |
| 4.2 | Demonstrate a synthetic pathways for synthesis of natural products              | discussion<br>• Library<br>visits<br>• Web-based<br>study   | <ul> <li>performance<br/>systems</li> <li>individual<br/>and group<br/>presentation<br/>s</li> </ul> |
| 5.0 | Psychomotor   |   |  |
| 5.1 | NOT APPLICABLE  |   |  |
| 5.2 |   |   |  |

| 5. Sc | hedule of Assessment Tasks for Students During the Semester                                     |             |  |
|-------|---|-------------|--|
|       | Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.) | Week<br>Due | Proporti<br>on of<br>Total<br>Assessm<br>ent |
| 1     | First regular Exam  | 6           | 20%  |
| 2     | Second regular Exam   | 12          | 20%  |
| 3     | Assignments   |             | 10   |
| 4     | Final Exam  | 16          | 50%  |

#### 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)



- We have faculty members to provide counseling and advice.
- Office hours: During the working hours weekly.
- Academic Advising for students.

#### **E.** Learning Resources

1. List Required Textbooks

- John McMurry's "Organic Chemistry, 8<sup>th</sup> edition, International Edition" 2011, Brooks/Cole
- John A. Joule, Keith Mills "Heterocyclic Chemistry, 5<sup>th</sup> Edition" 2010, Wiley-Blackwell
- John A. Joule, <u>Keith Mills</u> "*Heterocyclic Chemistry at a Glance, 2<sup>nd</sup> Edition*" 2012, Wiley-Blackwell

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

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

- <u>Sujata V. Bhat, B.A. Nagasampagi, Meenakshi Sivakumar</u> "*Chemistry of natural products*, *1<sup>st</sup>Edition*" 2005, Springer
- <u>Raymond Cooper, George Nicola</u> "*Natural Products Chemistry* : *Sources, Separations and Structures,* 1<sup>st</sup>Edition" 2014, CRC Press
- <u>Rensheng Xu, Yang Ye, Weimin Zhao</u> " Introduction to Natural Products Chemistry, 1<sup>st</sup>Edition" 2011, CRC Press

4. List Electronic Materials (eg. Web Sites, Social Media, Blackboard, etc.)

- <u>http://www.chemweb.com</u>
- <u>http://www.sciencedirect.com</u>
- <u>http://www.rsc.org</u>

5. 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.)
  - Classrooms capacity (30) students.
  - Providing hall of teaching aids including computers and projector.

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





#### Room equipped with computer and projector and TV.

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

#### • No other requirements.

#### G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Complete the questionnaire evaluation of the course in particular.

- 2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor
  - Observations and the assistance of colleagues.
  - Independent evaluation for extent to achieve students the standards.
  - Iindependent advice of the duties and tasks.

3 Processes for Improvement of Teaching

- Workshops for teaching methods.
- Continuous training of member staff.
- Review of strategies proposed.
- Providing new tools for learning.
- The application of e-learning.
- Eexchange of experiences internal and external.

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)

- Check marking of a sample of exam papers, or student work.
- Exchange corrected sample of assignments or exam basis with another staff

#### member for the same course in other faculty.

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

- Periodic Review of the contents of the syllabus and modify the negatives.
- Consult other staff of the course.
- Hosting a visiting staff to evaluate of the course.
- Workshops for teachers of the course.

