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| **Philadelphia University** | PHILADELPHIA UNIVERSITY THE WAY TO THE FUTURE | **Approved Date: 16/10/2022** |
| **Faculty: Pharmacy** | | **Issue:** |
| **Department: Pharmacy** | | **Credit Hours: 3** |
| **Academic Year: 2022-2023** | **Course Syllabus** | **Bachelor** |

## Course Information

| Course No. | Course Title | Prerequisite |
|---|---|---|
| **0510221** | **Pharmacognosy and Phytochemistry** | **Pharmaceutical Organic Chemistry (2) (0510210)** |

| Course Type | Class Time | Room No. |
|---|---|---|
| ☐ Univirsity Requirement ☐ Faculty Requirement<br>☐ Major Requirement ☐ Elective ■ Compulsory | **Sec 3:** Mon, Wed: 11:15 - 12:45 | |

## Instructor's Information

| Name | Office No. | Phone No. | Office Hours | E-mail |
|---|---|---|---|---|
| **Dr. Balakumar Chandrasekaran** | **517** | | Mon, Wed: 11:15 - 12:55 | balakumar@philadelphia.edu.jo |

## Course Delivery Method

| ☐ **Blended** | ☐ **Online** | ■ **Physical** | |
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| **Learning Model** | | | |
| **Percentage** | **Synchronous** | **Asynchronous** | **Physical** |
| | | | **100%** |

## Course Description

The course is designed to provide the student with basic information about pharmacognosy & phytochemistry, in terms of nomenclature, taxonomy, monographs, quality control, methods for extraction, characterization, detection of the active ingredient in medicinal plants, complementary and alternative medicine (CAM), pharmacologically active compounds obtained from natural origin mainly the plant origin, secondary metabolites as alkaloids, cardiac glycosides and anthraquinone glycosides. The chemical structures of these studied phytochemicals will be granted much interest. The student has to recognize the chemical structure mostly with its main features and is expected to be able to relate it to its botanical source, use, toxicity, and interactions with other drugs. Special emphasis will be made on those products used in pharmacy as prescription-only medicine, controlled drugs, and OTC. The course also has a mention of examples of semi-synthetic or synthetic drugs related to naturally occurring drugs, such as opium alkaloids.

## Course Learning Outcomes

| Number | Outcome | Corresponding Program Outcomes | Corresponding Competencies |
|---|---|---|---|
| **Knowledge** | | | |
| **K1** | Be familiar with the main terminology and definitions in pharmacognosy. | **Kp1** | **C1** |
| **K2** | Demonstrate the principles of the related analytical and scientific techniques. | **Kp1** | **C1** |
| **K3** | Categorize the main active ingredients from the natural sources (plants, animals, etc.), recognize their chemical structures, and illustrate the structure-activity relationship. | **Kp1, Kp2** | **C1, C2** |
| **K4** | Summarize the main putative pharmacological effects of the studied medicinal plants depending on their phytochemical content. | **Kp1, Kp2** | **C1, C2** |
| **K5** | State the main features of the pharmacological profile of the main active ingredients in plants and other natural sources (activity, toxicity, mechanism of action, etc.). | **Kp1, Kp2** | **C1, C2** |
| **Skills** | | | |
| **S1** | Perform some studied analytical techniques (extraction, chromatography, tissue culture, etc.) | **Sp2, Sp3, Sp5** | **C8, C9, C11** |
| **S2** | Classify medicinal plants according to their expected biological activities. | **Sp2, Sp3, Sp5** | **C8, C9, C11** |
| **S3** | Approve and validate medicines as possible treatments, or part of treatment for diseases. | **Sp2, Sp3, Sp5** | **C8, C9, C11** |
| **S4** | Evaluate the possible benefits and risks of the use of medicinal plants in the treatment of diseases and ailments. | **Sp2, Sp3, Sp5** | **C8, C9, C11** |

## Learning Resources

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| **Course Textbook** | Pharmacognosy Trease and Evans. 16th Edition, 2009, Published by ELBS, London ISBN 978-0702029332 |
| **Supporting References** | • Drugs of Natural Origin, 7th edition 2015 Gunnar Samuelsson. Swedish Pharmaceutical Press, ISBN 978—91-980942-5-1.<br>• Medicinal natural products, a biosynthetic approach, 3rd edition, 2009 Paul Dewick,<br>John Wiley & Sons Ltd, The Atrium, Southern Gate, |

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| | Chichester, West Sussex, PO19 8SQ, United Kingdom, ISBN 0 471 49640<br>• Pharmacognosy, phytochemistry, Medicinal Plants. 2nd edition Jean Bruneton: Springer Verlag, 2008, ISBN: 1898298130, 2743000287 |
| **Supporting Websites** | • Phytochemistry<br>• Natural Products Research<br>• Journal of Phytochemistry<br>• Fitooterapia<br>• Pharmaceutical Biology<br>• Journal of Ethnopharmacology |
| **Teaching Environment** | ■ **Classroom** ☐ **laboratory** ☐ **Learning Platform** ☐ **Other** |

## Meetings and Subjects Time Table

| Week | Topic | Learning Method* | Task | Learning Material |
|---|---|---|---|---|
| **1** | Introductory guidance topics and issues: vision and mission of the Faculty, course syllabus | | | Provided in the Learning Resources table |
| **2** | Introduction, definitions: crude drug, advanced crude drug, Classification, indigenous and cultivated plants, factors involved in production of plants, official drugs, monographs. | Lecture | | |
| **3** | Quality control | Lecture, Flipped learning | Homework | |
| **4** | Tissue culture. | Lecture Flipped, learning | Short presentation | |
| **5** | ALKALOIDS:<br>Introduction,<br>Nomenclature, Classification<br>Physiological significance, Detection, Isolation, and Biosynthesis. | Lecture | | |
| **6** | Amino alkaloids and Biosynthesis:<br>Ephedrine and pseudoephedrine, cathine and cathinone, mescaline, muscarine, and colchicine | Lecture, Collaborative learning | Case study | |
| **7** | Aziridine alkaloids:<br>Mytomicine C.<br>Pyridine alkaloids and Biosynthesis:<br>Nicotine, trigonelline, epibatidine<br>Piperidine alkaloids and Biosynthesis:<br>Coniine, arecoline, lobeline, pelletierine. | Lecture,<br><br>Problem-solving based learning | Short report | |
| **8** | Pyrrolizidine alkaloids:<br>Distribution in the plants and | Lecture, | Video-washing | |

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| | mechanism of hepatotoxicity<br>Tropane alkaloids and Biosynthesis:<br>Hyoscyamine and atropine, scopolamine, cocaine. | Problem-solving based learning | report | |
| **9** | Quinoline alkaloids and Biosynthesis:<br>Cinchona alkaloids, camptothecin derivatives.<br>Quinolizidine alkaloids and Biosynthesis:<br>Sparteine, lupine, anagyrine. | Lecture,<br><br>Collaborative learning | Homework | |
| **10** | Isoquinoline alkaloids and Biosynthesis:<br>Berberine and protoberberine.<br>Tetrahydroisoquinoline alkaloids:<br>Emetine and cephaeline. | Lecture,<br><br>Collaborative learning | Homework | |
| **11** | **MID-TERM EXAM**<br>**********<br>Bisbenzylisoquinoline alkaloids:<br>Tubocurarine, toxiferine.<br>Benzophenanthridine alkaloids and Biosynthesis: Sanguinarine. | | | |
| **12** | Indole alkaloids and Biosynthesis:<br>Physostigmine, ergot alkaloids, vinca alkaloids, and nux-vomica.<br>Imidazole alkaloids:<br>Pilocarpine.<br>Amaryllidaceae alkaloids:<br>Galanthamine. | Lecture,<br>Problem-solving based learning | Case study | |
| **13** | CARDIAC GLYCOSIDES:<br>Pharmacology and chemistry. | Lecture,<br><br>Problem-solving-based learning.<br>Video-watching | Case study<br><br>Short report | |
| **14** | Digitalis, Strophanthus, squill, oleander | Lecture, | | |
| **15** | ANTHRAQUINONES:<br>Pharmacology and chemistry | Lecture | | |
| **16** | Cascara, Rhubarb, Senna, Aloe, Carmine, Hypericin.<br>**FINAL EXAM** | | | |

## Course Contributing to Learner Skill Development

| **Using Technology** |
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| • Using PowerPoint or any relevant program for preparing presentations.<br>• Demonstration of data in various forms as plots, bars, etc., and illustrating them. |
| **Communication Skills** |
| • Report writing.<br>• Teamwork in solving case studies and problems |
| **Application of Concept Learnt** |
| • The suggestion of medications for various diseases and ailments.<br>• Participation in patient reassurance and support of his psychological health by offering |

advice and solutions.
- Involvement in the activities of drug discovery.

## Assessment Methods and Grade Distribution

| Assessment Methods | Grade | Assessment Time (Week No.) | Course Outcomes to be Assessed |
|---|---|---|---|
| **Mid Term Exam** | 30% | 11th Week | **K1-K5 S1-S4** |
| **Term Works*** | 30% | Continous | **K1-K5 S1-S4** |
| **Final Exam** | 40% | 16th Week | **K1-K5 S1-S4** |
| **Total** | 100% | | |

* Include quizzes, in-class and class assignments, presentations, reports, videotaped assignment, group, or individual project.

## Alignment of Course Outcomes with Learning and Assessment Methods

| Number | Learning Outcomes | Corresponding Competencies | Learning Method* | Assessment Method** |
|---|---|---|---|---|
| **Knowledge** | | | | |
| **K1** | Be familiar with the main terminology and definitions in pharmacognosy | C1 | Lecture | Short exams with subjective and objective-typed questions. |
| **K2** | Demonstrate the principles of the related analytical and scientific techniques. | C1, C6 | Lecture, flipped learning | -Short exams with subjective and objective-typed questions. -Video-watching assignment evaluation. |
| **K3** | Categorize the main active ingredients from the natural sources (plants, animals, etc.), recognize their chemical structures, and illustrate the structure-activity relationship. | C1, C2 | Lecture, Collaborative learning, Problem solving-based learning | -Short exams with subjective and objective-typed questions. |
| **K4** | Summarize the main putative pharmacological effects of the studied medicinal plants depending on their | C1, C2 | Lecture, Flipped learning, | --Short exams with subjective and |

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| | phytochemical content. | | collaborative learning, Problem solving-based learning. | objective-typed questions. -Short report-writing. -Homeworks. Presentation |
| **K5** | State the main features of the pharmacological profile of the main active ingredients in plants and other natural sources (activity, toxicity, mechanism of action, etc.). | C1, C2 | Lecture, Flipped learning, collaborative learning, Problem solving-based learning. | -Case-study solving reports. -Short exams with subjective and objective-typed questions. Short report-writing. -Presentation. |
| **Skills** | | | | |
| **S1** | Perform some studied analytical techniques (extraction, chromatography, tissue culture, etc.) | C8, C9, C11 | Lecture, collaborative learning, problem-solving-based learning, flipped learning. | -Case-study solving reports. -Short exams with subjective and objective-typed questions. Short report-writing. -Presentation. -Plot and graph illustrations. -Video-watching commenting evaluation. |
| **S2** | Classify medicinal plants according to their expected biological activities. | C8, C9, C11 | Lecture, problem-solving-based learning, flipped learning | -Short exams with subjective and objective-typed questions. Short report-writing. -Presentation. - Short report -writing. |

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| **S3** | Approve and validate medicines as possible treatments, or part of treatment for diseases. | C8, C9, C11 | Lecture, Case study, problem-solving-based learning, flipped learning. | -Short exams with subjective and objective-typed questions. Short report-writing. -Presentation. -Video-watching commenting evaluation. Homeworks. -Simulation scinarios. |
| **S4** | Evaluate the possible benefits and risks of the use of medicinal plants in the treatment of diseases and ailments. | C8, C9, C11 | Lecture, case-study, flipped learning. | -Short exams with subjective and objective-typed questions. Short report-writing. -Presentation. -Video-watching commenting evaluation. Homeworks. -Simulation scenarios. |

*Inclusion of lecture, flipped class, project-based learning, problem-solving learning, collaboration learning.
** Inclusion of quizzes, in-class and out-of-class assignments, presentations, reports, videotaped assignments, group or individual projects.

## Course Polices

| Policy | Policy Requirements |
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| **Passing Grade** | The minimum pass for the course is (50%) and the minimum final mark is (35%). |
| **Missing Exams** | • Anyone absent from a declared semester exam without a sick or compulsive excuse accepted by the dean of the college that proposes the course, a zero mark shall be placed on that exam and calculated in his final mark.<br>• Anyone absent from a declared semester exam with a sick or compulsive excuse accepted by the dean of the college that proposes the course must submit proof of his excuse within a week from the date of the excuse's disappearance, and in this case, the subject teacher must hold a compensation exam for the student.<br>• Anyone absent from a final exam with a sick excuse or a compulsive excuse accepted by the dean of the college that proposes the material must submit proof of his excuse within three days from the date of holding that exam. |

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| **Attendance** | The student is not allowed to be absent more than (15%) of the total hours prescribed for the course, which equates to six lecture days (n t) and seven lectures (days). If the student misses more than (15%) of the total hours prescribed for the course without a satisfactory or compulsive excuse accepted by the dean of the faculty, he is prohibited from taking the final exam and his result in that subject is considered (zero), but if the absence is due to illness or a compulsive excuse accepted by the dean of the college that The article is introduced, it is considered withdrawn from that article, and the provisions of withdrawal shall apply to it. |
| **Academic Integrity** | Philadelphia University pays special attention to the issue of academic integrity, and the penalties stipulated in the university's instructions are applied to those who are proven to have committed an act that violates academic integrity, such as cheating, plagiarism (academic theft), collusion, intellectual property rights. |

## Program Learning Outcomes to be Assessed in this Course

| Number | Learning Outcome | Course Title | Assessment Method | Targeted Performance level |
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## Description of Program learning Outcomes Assessment Method

| Number | Detailed Description of Assessment |
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## Assessment Rubric of the Program Learning Outcomes

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