FACULTY OF LIFE SCIENCES

SYLLABUS

FOR

Pre-Ph.D Course in Pharmaceutical Sciences
(Credit Based Evaluation & Grading System)

Examinations: 2019-20

GURU NANAK DEV UNIVERSITY
AMRITSAR

Note:  (i) Copy rights are reserved.
      Nobody is allowed to print it in any form.
      Defaulters will be prosecuted.

      (ii) Subject to change in the syllabi at any time.
      Please visit the University website time to time.
### Course Scheme

<table>
<thead>
<tr>
<th>Course No.</th>
<th>C/E/I</th>
<th>Course Title</th>
<th>Lecture (L)</th>
<th>Tutorial (T)</th>
<th>Practical (P)</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHL901</td>
<td>C</td>
<td>Research Methodology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

**Elective (Choose any three courses)**

<table>
<thead>
<tr>
<th>Course No:</th>
<th>C/E/I</th>
<th>Course Title</th>
<th>Lecture (L)</th>
<th>Tutorial (T)</th>
<th>Practical (P)</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHL 902</td>
<td>E</td>
<td>Pharmaceutical Techniques</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PHL903</td>
<td>E</td>
<td>Advanced Medicinal Chemistry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PHL905</td>
<td>E</td>
<td>Advanced Drug Delivery Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PHL906</td>
<td>E</td>
<td>Advances in Phytomedicine</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

*Interdisciplinary/Optional Course

<table>
<thead>
<tr>
<th>I</th>
<th></th>
<th></th>
<th></th>
<th>04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Credits</td>
<td>16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PRE PH.D COURSE IN PHARMACEUTICAL SCIENCES  
(Credit Based Evaluation & Grading System)

PHL-901 - Research Methodology

Time: 3 Hrs.

Credits 3-0-0
Max. Marks : 100
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Note: The course will be numerical oriented to train the students for the analysis of research data. Use of calculators will be allowed in the examination.

SECTION-A
1. **Descriptive statistics**: Statistical expressions, central tendency, dispersion of data (arithmetic and geometric), moments, skewness, kurtosis, sample size estimation.
2. **Probability**: Concept of probability, conditional probability, distributions: Normal, Poisson, binomial, ‘t’, $\chi^2$, F-distributions.

SECTION-B
3. **Testing of hypothesis**: Central limit theorem, null hypothesis and alternative hypotheses, Z-test, Student’s t-test, $\chi$-square, F-test, sample size, confidence intervals, odds ratio, index numbers, Probit analysis.
4. **Correlation and regression analysis**: Linear correlation and regression, exponential regression, logarithmic regression, reciprocal regression, Michael-Menten’s regression, logistic regression, Gompertz regression, monomolecular regression.

SECTION-C
5. **Multiple correlation and regression**: MLR with 2 and 3 independent variables, quadratic and cubic polynomial regressions, Beta regression, sine curve, multiple correlation, partial correlation, path analysis, time series analysis.
6. **Experimental designs**: Experimental designs, central composite designs with 2 and 3 factors.

SECTION-D
7. **Analysis of Variance**: Assessing normality, one way and 2-way ANOVA, Tukey's multiple comparison test, HSD.
9. **Non-parametric tests**: Wilcoxon’s, Mann-Whitney’s tests, Spearman’s rank correlation, Kendall’s Tau.
10. **Basic Greek and Latin words**: The students will learn Greek alphabet and more than 100 basic roots and words used in science.

Note: The students will be asked to submit an assignment of computer softwares designed by them on the basis of the Research methodology syllabus.
References:


PRE PH.D COURSE IN PHARMACEUTICAL SCIENCES
(Credit Based Evaluation & Grading System)

PHL902: Pharmaceutical Techniques (Elective)

3 Credits (3-0-0)  
Max. Marks : 100
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section-A

Section-B

Section-C
Section-D

7. **Bioassays:** in-vitro and in-vivo techniques Bioavailability and bioequivalence testing: Definitions, in-vitro and in-vivo bioavailability testing.

8. **Immunochemical Techniques:** Immunoelectrophores, Immunoprecipitation ELISA, Radio-immuno assays. Southern blot and northern blot assays.

9. **Lyophilization:** Principles and Practice of freeze-drying. Freeze drying equipment

**Recommended Books:**

5. Pharmaceutical Dosage forms Series by Herbert Lieberman
7. Remington: The Science and Practice of Pharmacy (Remington the Science and Practice of Pharmacy) Lippincott Williams & Wilkins.
PRE PH.D COURSE IN PHARMACEUTICAL SCIENCES
(Credit Based Evaluation & Grading System)

PHL903: Advanced Medicinal Chemistry (Elective)

Time: 3 Hrs.
Max. Marks : 100
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Pharmaceutical Chemistry (Source/ synthesis, Structure, stereochemistry, physico-chemical properties, Structure activity relationships. Mode of action and Applications) of the following classes of drugs:

Section-A


Section-B

Section-C
Section-D


Books Recommended:

2. W.C. Foye, Principle of Medicinal Chemistry, Lea & Febiger, Philadelphia, USA
PRE PH.D COURSE IN PHARMACEUTICAL SCIENCES
(Credit Based Evaluation & Grading System)

PHL905: Advanced Drug Delivery Systems (Elective)

Time: 3 Hrs.

Max. Marks : 100
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section-A

1. Pharmaceutical Product Development and Its Associated Quality System
2. Procurement, Qualification, and Calibration of Laboratory Instruments

Section-B

3. Application of Pharmacokinetics and Pharmacodynamics in the Design of Controlled Delivery Systems
4. Physiological and Biochemical Barriers to Drug Delivery

Section-C

5. Diffusion-Controlled Drug Delivery Systems
6. Dissolution Controlled Drug Delivery Systems

Section-D

8. Prodrugs as Drug Delivery Systems
PRE PH.D COURSE IN PHARMACEUTICAL SCIENCES  
(Credit Based Evaluation & Grading System)

Books Recommended:


PHL906: ADVANCES IN PHYTOMEDICINE (Elective)

3 Credits (3-0-0)

Max. Marks : 100
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section-A
1. Natural sources of drugs and their contribution to modern therapeutics
   1.1 Plants
   1.2 Animals
   1.3 Minerals
   1.4 Marine
   1.5 Plant Tissue culture as a source of biomedicinals
   1.6 Natural Products as leads for new pharmaceuticals

Section-B
2. General methods of extraction and separation techniques.
3. An introduction to active constituents of drugs: Their extraction, classification and identification tests.

Section-C

Section-D
5. Quality control of crude drugs: Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation.
PRE PH.D COURSE IN PHARMACEUTICAL SCIENCES
(Credit Based Evaluation & Grading System)

**Reading Material Recommended:** (Latest editions unless specified):

7. WHO guidelines on relevant topics.
9. Pharmacopoeia of India, Govt. of India, Ministry of health and family welfare, Delhi