



CHARUSAT
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

**STUDENT INFORMATION
BOOKLET FOR THE
ACADEMIC YEAR 2025-26
(VOLUME – 2 : B.Pharm)**

Ramanbhai Patel College of Pharmacy

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CONTENT

Sr. No.	Description	Pg. No.
	Preamble	3
	About the Institute	4
1	PROGRAMME SPECIFIC	
1.1	Academic Regulations	6
1.2	Programme Structure (Teaching & Examination Scheme)	6
1.3	Learning Resources	322
1.4	Academic Calendar	323
2	VARIOUS ADMINISTRATIVE PROCESS	
2.1	Payment of tuition fees or Other charges	328
2.2	Process of Acquiring WIFI access	329
2.3	Process to obtain required Certificate from the institute	330
2.4	Process to obtain required Certificate from the university office	331
2.5	Process to obtain Duplicate Grade Card / Name Correction in Grade Card	332
2.6	Process to obtain Migration Certificate	332
2.7	Process for Academic Document Verification by External Agency	332
2.8	Process for acquiring Transcript OR E-transcript	334
3	FORMS FOR UNDERTAKINGS & DECLARATIONS	
3.1	Undertaking for Observing Rules and Regulations of the university	336
3.2	Declaration for Code of Conducts & Disciplinary Rules	337
3.3	Undertaking for Examination Rules and Regulations	338
3.4	Undertaking for Refraining from Possession and Use of Drugs and Alcohol	339
4	IMPORTANT CONTACTS	340

PREAMBLE

The Handbook (Student's Information Booklet) for Students, printed in two volumes contain General Information Respectively about the CHARUSAT University and detailed information about Indukaka Ipcowala Institute of Management.

Handbook Volume-I contains information about general rules to be followed by the students on campus. It gives information about the general facilities and support available for the students on campus. It gives insight about the discipline and conduct rules of the University.

This Handbook (Student's Information Booklet) is for the purpose of providing information to the students about the University and its programmes and is not a Regulation book of the University. Hence, no claim can be made based on the information given in the book.

The University / Institute reserves the right to amend the rules and regulations mentioned in the Handbook without any prior notice. The decision of the University shall be final on all matters. For any clarification, the Student Section may be contacted.

Handbook Volume-II (Student's Information Booklet) contains academic information about the Institute, which includes the Academic Rules and Regulations regarding academic requirements and academic conduct of the students at the University including different policies and forms. Besides, it includes important information on registration, grading system, academic standards, attendance norms, discipline and the like. The students shall abide by these rules and shall, at all times, conduct in a manner so as to bring credit to the University and enhance its prestige in the society.

It is prime responsibility of the students to get familiar (themselves) with the rules and regulations

About the Institute

Ramanbhai Patel College of Pharmacy (RPCP) is a constituent Institute of Charotar University of Science and Technology (CHARUSAT). RPCP was established in the year 2004 with a view to promote excellence in Pharmacy Education and to prepare young talent to meet the challenges of Industrial Pharmacy and Pharmacy Practice. The Institute has the patronage of Zydus Cadila Health Care Ltd; patronized by Shri Pankaj Patel, CMD, Zydus Cadila Healthcare Ltd to commemorate his father, Late Shri Ramanbhai Patel. A Visionary Entrepreneur and a Philanthropist. M.Pharm Programs at RPCP are executed under the auspices of T. P. Patel Centre for PG studies in Pharmacy. The centre in patronized by Shri Jagdishbhai Patel and Shri H. T. Patel and their families to monumentalize their father, Late Shri T. P. Patel.

Vision

To Become a Premier Pharma Institute by Creating World Class Pharmacists and Researchers

Mission

To Strive for the Excellence in Pharmaceutical Sciences through Quality Education and Research

SECTION - 1

PROGRAMME SPECIFIC: B.Pharm

1.1 Academic Regulation

&

1.2 B.Pharm Programme Structure (Teaching & Examination Scheme)



ACADEMIC REGULATIONS and SYLLABUS

**Faculty of Pharmacy
Bachelor of Pharmacy Programme**

1st to 8th Semester of B.Pharm.

A.Y. 2025-2026

(AS PER PCI SYLLABUS)

Ramanbhai Patel College of Pharmacy

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CHAROTAR UNIVERSITY OF SCIENCE

& TECHNOLOGY

BACHELOR OF PHARMACY (B.Pharm.) PROGRAMME

Vision of RPCP

To Become a Premier Pharma Institute by Creating World Class Pharmacists
and Researchers

Mission of RPCP

To Strive for the Excellence in Pharmaceutical Sciences through Quality
Education and Research

Programme Educational Objectives

1. To produce competent pharmacy graduates who shall be able to secure their career in pharmaceutical industry and/or institution of higher studies by dissemination of knowledge and training in pharmacy.
2. To acquire the knowledge about advances in pharmacy and to orient towards socially relevant research and development.
3. To encourage students for self-learning through modern information resources.
4. To enhance communication and critical thinking abilities for effective delivery of societal responsibilities.
5. To nurture and facilitate entrepreneurial capabilities and opportunities.

PROGRAM OUTCOMES

- 1. Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical science, pharmaceutical science, behavioral, social and administrative pharmacy science and manufacturing practices.
- 2. Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.
- 3. Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
- 4. Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
- 5. Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.
- 6. Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
- 7. Pharmaceutical Ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
- 8. Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
- 9. The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
- 10. Environment and sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
- 11. Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

REGULATIONS

1. Short Title and Commencement

These regulations shall be called as “The Revised Regulations for the B.Pharm. Degree Program (CBCS) of the Pharmacy Council of India, New Delhi”. They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by Pharmacy Council of India.

2. Minimum qualification for admission

2.1 First year B.Pharm.:

Candidate shall have passed 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B/P.C.M.B.) as optional subjects individually. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

2.2. B.Pharm. lateral entry (to third semester):

A pass in D.Pharm. course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

3. Duration of the program

The course of study for B.Pharm. shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

5. Working days in each semester

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from December/January to May/June in every calendar year.

6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

7. Program/Course credit structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, tutorial hours, practical classes, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra- curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week.

7.1. Credit assignment

7.1.1. Theory and laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and /or tutorial (T) hours and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course and is obtained by using a multiplier of one (1) for lecture and tutorial hours and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a

theory course having three lectures and one tutorial per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

7.2. Minimum credit requirements

The minimum credit points required for award of a B.Pharm. degree is 229/231^{\$/232#}. These credits are divided into Theory courses, Tutorials, Practical, Practice School and Project over the duration of eight semesters. The credits are distributed semester-wise as shown in Table IX. Courses generally progress in sequences, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

The lateral entry students shall get 52 credit points transferred from their D.Pharm. program. Such students shall take up additional remedial courses of ‘Communication Skills’ (Theory and Practical) and ‘Computer Applications in Pharmacy’ (Theory and Practical) equivalent to 3 and 4 credit points respectively, a total of 7 credit points to attain 59 credit points, the maximum of I and II semesters.

^{\$Applicable ONLY for the students studied Physics/Chemistry/Botany/Zoology at HSC and appearing for Remedial Mathematics course.}

^{#Applicable ONLY for the students studied Mathematics/Mathematics/Physics/Chemistry at HSC and appearing for Remedial Biology course.}

8. Academic work

A regular record of attendance both in Theory and Practical shall be maintained by the teaching staff of respective courses.

9. Program Committee

1. The B.Pharm. program shall have a Program Committee constituted by the Head of the institution in consultation with all the Heads of the departments.

2. The composition of the Program Committee shall be as follows:

A senior teacher shall be the Chairperson, one teacher from each department handling B.Pharm. courses and four student representatives of the program (one from each academic year), nominated by the Head of the institution.

3. Duties of the Program Committee:

- i. Periodically reviewing the progress of the classes.
- ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
- iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.
- iv. Communicating its recommendation to the Head of the institution on academic matters.
- v. The Program Committee shall meet at least thrice in a semester preferably at the end of each Sessional exam (Internal Assessment) and before the end semester exam.

10. Examinations/Assessments

The scheme for internal assessment and end semester examinations is given in Table – X.

10.1 End semester examinations

The End Semester Examinations for each theory and practical course through semesters I to VIII shall be conducted by the University except for the subjects with asterisk symbol (*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the University.

10.2 Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table-I: Scheme for awarding internal assessment: Continuous mode

Theory		
Criteria	Maximum Marks	
Attendance (Refer Table – XII)	4	2
Academic activities (Average of any 3 activities e.g. quiz, assignment, open book test, field work, group discussion and seminar)	3	1.5
Student – Teacher interaction	3	1.5
Total	10	5
Practical		
Attendance (Refer Table – XII)	2	
Based on Practical Records, Regular viva voce, etc.	3	
Total	5	

Table- II: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95 – 100	4	2
90 – 94	3	1.5
85 – 89	2	1
80 – 84	1	0.5
Less than 80	0	0

10.2.1 Sessional Exams

Two Sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical Sessional examinations is given below. The average marks of two Sessional exams shall be computed for internal assessment as per the requirements given in tables containing schemes for internal assessments and end semester examinations semester wise.

Sessional exam shall be conducted for 30 marks for theory and shall be computed for 15 marks. Similarly Sessional exam for practical shall be conducted for 40 marks and shall be computed for 10 marks.

Question paper pattern for theory Sessional examinations or subjects having University examination

I. Multiple Choice Questions (MCQs) = $10 \times 1 = 10$
OR

For subjects having Non-University Examination

I. Long Answers (Answer 1 out of 2) = $1 \times 10 = 10$
II. Short Answers (Answer 4 out of 6) = $4 \times 5 = 20$

Total = 30 marks

Question paper pattern for practical sessional examinations

I. Synopsis	=	10
II. Experiments	=	25
III. Viva voce	=	05
Total	=	40 marks

11. Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of B.Pharm. program if he/she secures at least 50% marks in that particular course including internal assessment. For example, to be declared as PASS and to get grade, the student has to secure a minimum of 50 marks for the total of 100 including continuous mode of assessment and end semester theory examination and has to secure a minimum of 25 marks for the total 50 including internal assessment and end semester practical examination.

12. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However, his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

13. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the Sessional exam component of the internal assessment. The re-conduct of the Sessional exam shall be completed before the commencement of next end semester theory examinations.

14. Re-examination of end semester examinations

Re-examination of end semester examination shall be conducted as per the schedule given in table XIII. The exact dates of examinations shall be notified from time to time.

Table- XIII: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates	
		Remedial Examination-1	Remedial Examination-2*
I, III, V and VII	November / December	After 15 days of the declaration of the result of the end semester Examination	last week of June/ end of the Academic Year, which is earlier
II, IV, VI and VIII	May / June	After 15 days of the declaration of the result of the end semester Examination	

*If a students who remain left from the end semester examination and remedial examination-1.

**Question paper pattern for end semester theory examinations
For 75 marks paper**

I. Multiple Choice Questions (MCQs)	=	20 x 1	= 20
OR			
Objective Type Questions (10 x 2)	=	10 x 2	= 20
(Answer all the questions)			
II. Long Answers (Answer 2 out of 3)	=	2 x 10	= 20
III. Short Answers (Answer 7 out of 9)	=	7 x 5	= 35
<hr/>			
Total	=	75 marks	

For 50 marks paper

I. Long Answers (Answer 2 out of 3)	=	2 x 10	= 20
II. Short Answers (Answer 6 out of 8)	=	6 x 5	= 30
<hr/>			
Total	=	50 marks	

For 35 marks paper

I. Long Answers (Answer 1 out of 2)	=	1 x 10	= 10
II. Short Answers (Answer 5 out of 7)	=	5 x 5	= 25
<hr/>			
Total	=	35 marks	

Question paper pattern for end semester practical examinations

I. Synopsis	=	5
II. Experiments	=	25
III. Viva voce	=	5
<hr/>		
Total	=	35 marks

15. Academic Progression

No student shall be admitted to any examination unless he/she fulfils the norms given in 6. Academic progression rules are applicable as follows:

- **“Student will not be allowed to move to next year if she/he has not cleared all the courses of the previous year”**
- A student shall be eligible to carry forward all the courses of Ist semesters till the IInd semester examinations. However, he/she shall not be eligible to attend the courses of the IIIrd semester until all the courses of the Ist and IInd semesters are successfully completed.
- A student shall be eligible to carry forward all the courses of IIIrd semester till the IVth semester examinations. However, he/she shall not be eligible to attend the courses of the Vth semester until all the courses of the IIIrd and IVth semesters

are successfully completed.

- A student shall be eligible to carry forward all the courses of Vth semester till the VIth semester examinations. However, he/she shall not be eligible to attend the courses of the VIIth semester until all the courses of the Vth and VIth semesters are successfully completed.
- A student shall be eligible to carry forward all the courses of VIIth semester till the VIIIth semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of I, II, III, IV, V, VI and VII semesters are successfully completed.
- A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to VIII semesters within the stipulated time period as per the norms specified in 26.
- A lateral entry student shall be eligible to carry forward all the courses of IIIrd semester till the IVth semester examinations. However, he/she shall not be eligible to attend the courses of the Vth semester until all the courses of the IIIrd and IVth semesters are successfully completed.
- A lateral entry student shall be eligible to carry forward all the courses of Vth semester till the VIth semester examinations. However, he/she shall not be eligible to attend the courses of the VIIth semester until all the courses of the Vth and VIth semesters are successfully completed.
- A lateral entry student shall be eligible to carry forward all the courses of VIIth semester till the VIIIth semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of III, IV, V, VI and VII semesters are successfully completed.
- A lateral entry student shall be eligible to get his/her CGPA upon successful completion of the courses of III to VIII semesters within the stipulated time period as per the norms specified in 26.
- Any student who has given not more than 03 chances for successful completion of particular semester courses ONLY during the subsequent academic year as the case may be. In simpler terms there shall NOT be any ODD BATCH for any semester.

Note: “NA” (Not Appeared) should be considered as failed and treated as one head for deciding academic progression. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

16. Grading of performances

16.1 Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in below Table.

Table – IV: Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	AA	10	Outstanding
80.00 – 89.99	AB	9	Excellent
70.00 – 79.99	BB	8	Good
60.00 – 69.99	BC	7	Fair
50.00 – 59.99	CC	6	Average
Less than 50	FF	0	Fail
Absent	NA	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of “NA” and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

17. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called ‘Semester Grade Point Average’ (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses(Theory/Practical) in a semester with credits C1, C2, C3, C4 and C5 and the student’s grade points in these courses are G1, G2, G3, G4 and G5, respectively, and then students’ SGPA is equal to:

$$\text{SGPA} = \frac{C1G1+C2G2+C3G3+C4G4}{C1+C2+C3+C4}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the “F” and “Ab” grade awarded in that semester. For example, if a learner has a “F” or “Ab” grade in course 4, the SGPA shall then be computed as:

$$\text{SGPA} = \frac{C1G1+C2G2+C3G3+C4\text{Zero}}{C1+C2+C3+C4}$$

18. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the VIII semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VIII semesters and their courses. The CGPA shall reflect the failed status in case of "F" grade(s), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$\text{CGPA} = \frac{C1S1 + C2S2 + C3S3 + C4S4 + C5S5 + C6S6 + C7S7 + C8S8}{C1 + C2 + C3 + C4 + C5 + C6 + C7 + C8}$$

where C1, C2, C3,... is the total number of credits for semester I,II,III,... and S1,S2, S3,...is the SGPA of semester I,II,III,... .

19. Declaration of class

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction	= CGPA of 7.50 to 10.00 First
Class	= CGPA of 6.00 to 7.49
Second Class	= CGPA of 5.00 to 5.99
Pass Class	< CGPA of 5.00

20. Project work

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subject opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of five students). The projects shall be evaluated as per the criteria given below.

Evaluation of Dissertation Book:

Objective(s) of the work done	15 Marks
Methodology adopted	20 Marks
Results and Discussions	20 Marks
Conclusions and Outcomes	20 Marks
Total	75Marks

Evaluation of Presentation:

Presentation of work	25 Marks
Communication skills	20 Marks
Question and answer skills	30 Marks
Total	75Marks

Explanation: The 75 marks assigned to the dissertation book shall be same for all the students in a group. However, the 75 marks assigned for presentation shall be awarded based on the performance of individual students in the given criteria.

21. Industrial training (Desirable)

Every candidate shall be required to work for at least 150 hours spread over four weeks in a Pharmaceutical Industry/Hospital. It includes Production unit, Quality Control department, Quality Assurance department, Analytical laboratory, Chemical manufacturing unit, Pharmaceutical R&D, Hospital (Clinical Pharmacy), Clinical Research Organization, Community Pharmacy, etc. After the Semester – VI and before the commencement of Semester – VII, and shall submit satisfactory report of such work and certificate duly signed by the authority of training organization to the head of the institute.

22. Practice School

In the VII semester, every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time.

At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college level and grade point shall be awarded.

23. Award of Ranks

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the B.Pharm. program shall not be eligible for award of ranks. Moreover, the candidates should have completed the B.Pharm. program in minimum prescribed number of years, (four years) for the award of Ranks.

24 Award of degree

Candidates who fulfil the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

25. Duration for completion of the program of study

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

26. Re-admission after break of study

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

No condonation is allowed for the candidate who has more than 2 years of break up period and he/she has to rejoin the program by paying the required fees.

27. Extra Credit*

An extra 02 credits are to be offered to a student for achievements in co-curricular and extracurricular activities. This credit shall not be counted while considering the minimum credits for completing the program. The activities and appropriate weight (points) to be allocated to award an extra credit are broadly classified as per the tables below:

Extracurricular Activities (Weightage 50%) include:

Sr. No.	Name of the activity	Maximum Marks
1	Participation in any Sport	20
2	Participation in any Cultural event	20
3	Community and Extension activities	20
4	Any achievement includes award, prize or special recognition for event	20

Co-Curricular Activities (Weightage 50%) include:

Sr. No.	Name of the activity	Maximum Marks
1	Completion of certificate SWAYAM course (minimum 4 weeks)	20 (10 marks/course, given for a maximum two course)
2	Participation in Conference/Seminar/training program/Teach fest etc. (without Paper) includes a. State/University/Zonal level: 03 Marks b. National: 05 Marks c. International conference: 07 Marks	15
3	Presentation in Conference/Seminar/training program/Teach fest etc. includes a. Oral Presentation: 10 Marks b. Poster Presentation: 05 Marks	15
4	Publication in Peer-reviewed Journal (indexed in Web of Science and Scopus): a. First paper publication: 10 Marks b. Second paper publication: 10 Marks	20
5	Participation in other technical events like model preparation, Rangoli, Painting, Pharma receipt, dare to sell etc.: 05 Marks	05
6	Any achievement includes award, prize or special recognition for any technical events mentioned above: 05 Marks	05

***To earn an additional 02 credit, students must score 75% of the total marks.**

BACHELOR OF PHARMACY PROGRAMME
SCHEMES FOR INTERNAL ASSESSMENTS AND END
SEMESTER
EXAMINATIONS SEMESTER WISE

SEMESTER-I

SCHEME OF TEACHING (for [A] group students)

Course Code	Name of the Course	No. of hours	Tutorial	Credit Points
BPH1001	Human Anatomy and Physiology-I (Theory)	3	1	4
BPH1002	Pharmaceutical Analysis-I (Theory)	3	1	4
BPH1003	Pharmaceutics-I (Theory)	3	1	4
BPH1004	Pharmaceutical Inorganic Chemistry (Theory)	3	1	4
BPH1005	Remedial Biology (Theory)*	2	-	2
HS1001	Communication skills (Theory)*	2	-	2
BPH1001P	Human Anatomy and Physiology-I (Practical)	4	-	2
BPH1002P	Pharmaceutical Analysis-I (Practical)	4	-	2
BPH1003P	Pharmaceutics-I (Practical)	4	-	2
BPH1004P	Pharmaceutical Inorganic Chemistry (Practical)	4	-	2
BPH1005P	Remedial Biology (Practical)*	2	-	1
HS1001P	Communication skills (Practical)*	2	-	1
Total		36	4	30

SCHEME OF EVALUATION

Course Code	Name of the Course	Marks Distribution			Total	
		University (End Semester Exam)	Institute			
			Sessional Exams	Continuous Mode		
BPH1001	Human Anatomy and Physiology-I (Theory)	75	15	10	100	
BPH1002	Pharmaceutical Analysis-I (Theory)	75	15	10	100	
BPH1003	Pharmaceutics-I (Theory)	75	15	10	100	
BPH1004	Pharmaceutical Inorganic Chemistry (Theory)	75	15	10	100	
BPH1005	Remedial Biology (Theory)*	35	10	5	50	
HS1001	Communication skills (Theory)*	35	10	5	50	
BPH1001P	Human Anatomy and Physiology-I (Practical)	35	10	5	50	
BPH1002P	Pharmaceutical Analysis-I (Practical)	35	10	5	50	
BPH1003P	Pharmaceutics-I (Practical)	35	10	5	50	
BPH1004P	Pharmaceutical Inorganic Chemistry (Practical)	35	10	5	50	

BPH1005P	Remedial Biology (Practical)*	15	5	5	25
HS1001P	Communication skills (Practical)*	15	5	5	25
Total		540	210	750	

SEMESTER-I

SCHEME OF TEACHING (for [B] group students)

Course Code	Name of the Course	No. of hours	Tutorial	Credit Points
BPH1001	Human Anatomy and Physiology-I (Theory)	3	1	4
BPH1002	Pharmaceutical Analysis-I (Theory)	3	1	4
BPH1003	Pharmaceutics-I (Theory)	3	1	4
BPH1004	Pharmaceutical Inorganic Chemistry (Theory)	3	1	4
MTH1001	Remedial Mathematics (Theory)*	2	-	2
HS1001	Communication Skills (Theory)*	2	-	2
BPH1001P	Human Anatomy and Physiology-I (Practical)	4	-	2
BPH1002P	Pharmaceutical Analysis-I (Practical)	4	-	2
BPH1003P	Pharmaceutics-I (Practical)	4	-	2
BPH1004P	Pharmaceutical Inorganic Chemistry (Practical)	4	-	2
HS1001P	Communication skills (Practical)*	2	-	1
Total		34	4	29

SCHEME OF EVALUATION

Course Code	Name of the Course	Marks Distribution			Total	
		University (End Semester Exam)	Institute			
			Sessional Exams	Continuous Mode		
BPH1001	Human Anatomy and Physiology-I (Theory)	75	15	10	100	
BPH1002	Pharmaceutical Analysis-I (Theory)	75	15	10	100	
BPH1003	Pharmaceutics-I (Theory)	75	15	10	100	
BPH1004	Pharmaceutical Inorganic Chemistry (Theory)	75	15	10	100	
MTH1001	Remedial Mathematics (Theory)*	35	10	5	50	
HS1001	Communication Skills (Theory)*	35	10	5	50	
BPH1001P	Human Anatomy and Physiology-I (Practical)	35	10	5	50	
BPH1002P	Pharmaceutical Analysis-I (Practical)	35	10	5	50	
BPH1003P	Pharmaceutics-I (Practical)	35	10	5	50	
BPH1004P	Pharmaceutical Inorganic Chemistry (Practical)	35	10	5	50	
HS1001P	Communication skills (Practical)*	15	5	5	25	
Total		525	200		725	

SEMESTER-I

SCHEME OF TEACHING (for [AB] group students)

Course Code	Name of the Course	No. of hours	Tutorial	Credit Points
BPH1001	Human Anatomy and Physiology-I (Theory)	3	1	4
BPH1002	Pharmaceutical Analysis-I (Theory)	3	1	4
BPH1003	Pharmaceutics-I (Theory)	3	1	4
BPH1004	Pharmaceutical Inorganic Chemistry (Theory)	3	1	4
HS1001	Communication Skills (Theory)*	2	-	2
BPH1001P	Human Anatomy and Physiology-I (Practical)	4	-	2
BPH1002P	Pharmaceutical Analysis-I (Practical)	4	-	2
BPH1003P	Pharmaceutics-I (Practical)	4	-	2
BPH1004P	Pharmaceutical Inorganic Chemistry (Practical)	4	-	2
HS1001P	Communication Skills (Practical)*	2	-	1
Total		32	4	27

SCHEME OF EVALUATION

Course Code	Name of the Course	Marks Distribution			Total	
		University (End Semester Exam)	Institute			
			Sessional Exams	Continuous Mode		
BPH1001	Human Anatomy and Physiology-I (Theory)	75	15	10	100	
BPH1002	Pharmaceutical Analysis-I (Theory)	75	15	10	100	
BPH1003	Pharmaceutics-I (Theory)	75	15	10	100	
BPH1004	Pharmaceutical Inorganic Chemistry (Theory)	75	15	10	100	
HS1001	Communication skills (Theory)*	35	10	5	50	
BPH1001P	Human Anatomy and Physiology-I (Practical)	35	10	5	50	
BPH1002P	Pharmaceutical Analysis-I (Practical)	35	10	5	50	
BPH1003P	Pharmaceutics-I (Practical)	35	10	5	50	
BPH1004P	Pharmaceutical Inorganic Chemistry (Practical)	35	10	5	50	
HS1001P	Communication Skills (Practical)*	15	5	5	25	
Total		490	185		675	

* Non University Examination (NUE)

SEMESTER-II
SCHEME OF TEACHING

SCHEME OF EVALUATION

Course Code	Name of the Course	Marks Distribution			Total	
		University (End Semester Exam)	Institute			
			Sessional Exams	Continuous Mode		
BPH2001	Human Anatomy and Physiology-II (Theory)	75	15	10	100	
BPH2002	Pharmaceutical Organic Chemistry-I (Theory)	75	15	10	100	
BPH2003	Pharmaceutical Engineering (Theory)	75	15	10	100	
BPH2004	Computer Applications in Pharmacy (Theory)*	50	15	10	75	
BPH2001P	Human Anatomy and Physiology-II (Practical)	35	10	05	50	
BPH2002P	Pharmaceutical Organic Chemistry-I (Practical)	35	10	05	50	
BPH2003P	Pharmaceutical Engineering (Practical)	35	10	05	50	
BPH2004P	Computer Applications in Pharmacy (Practical)*	15	05	05	25	
HS101.02 B	Communicative English (Practical)	70	30		100	
---	A Course from Liberal Arts**	70	30		100	
Total		535	215		750	

* Non University Examination (NUE)

** Liberal Arts Elective Courses

Elective Course		Credits		Total hours	Examination scheme (Practical)		
Code	Name	Theory	Practical	--	Internal	External	Total
HSUS101	Liberal Arts - Painting	--	2	2	25	25	50
HSUS102	Liberal Arts - Photography	--	2	2	25	25	50
HSUS103	Liberal Arts - Sculpting	--	2	2	25	25	50
HSUS104	Liberal Arts - Pottery and Ceramic Art	--	2	2	25	25	50
HSUS105	Liberal Arts - Media and Graphic Design	--	2	2	25	25	50
HSUS106	Liberal Arts - Art and Craft	--	2	2	25	25	50
HSUS109	Liberal Arts - Dramatics	--	2	2	25	25	50
HSUS110	Liberal Arts - Contemporary Dance	--	2	2	25	25	50
HSUS111	Liberal Arts - Music (vocal)	--	2	2	25	25	50
HSUS112	Liberal Arts - Music (Instrumental) – Tabla	--	2	2	25	25	50
HSUS113	Liberal Arts - Music (Instrumental) – Guitar	--	2	2	25	25	50
HSUS114	Liberal Arts - Music (Instrumental) – Harmonium	--	2	2	25	25	50
HSUS115	Liberal Arts - Music (Instrumental) – Flute	--	2	2	25	25	50
HSUS116	Liberal Arts - Indian Classical Dance – Kathak	--	2	2	25	25	50
HSUS117	Liberal Arts - Indian Classical Dance – Bharatanatyam	--	2	2	25	25	50
Total		--	2	2	25	25	50
Total credits: 2, Total marks: 50							

SEMESTER-III
SCHEME OF TEACHING

SCHEME OF EVALUATION

Course Code	Name of the Course	Marks Distribution			Total
		University (End Semester Exam)	Institute	Sessional Exams	
BPH3001	Pharmaceutical Organic Chemistry-II (Theory)	75	15	10	100
BPH3002	Physical Pharmaceutics-I (Theory)	75	15	10	100
BPH3003	Pharmaceutical Microbiology (Theory)	75	15	10	100
BPH3004	Pathophysiology (Theory)	75	15	10	100
BPH3005	Environmental Sciences (Theory)*	50	15	10	75
BPH3001P	Pharmaceutical Organic Chemistry-II (Practical)	35	10	05	50
BPH3002P	Physical Pharmaceutics-I (Practical)	35	10	05	50
BPH3003P	Pharmaceutical Microbiology (Practical)	35	10	05	50
HS121.02 B	Creativity, Problem Solving and Innovation (Practical)	70	30		100
---	University Elective**	70	30		100
Total		595	230		825

* Non University Examination (NUE)

** University elective courses

Elective Course		Credits	Total hours	Examination scheme (Practical)		
Code	Name	Practical	--	Internal	External	Total
EC281.01	Introduction to MATLAB Programming	2	2	30	70	100
CE281.01	Art of Programming	2	2	30	70	100
CL281.01	Environmental Sustainability and Climate Change	2	2	30	70	100
CL283	SDG Handprint Laboratory	2	2	30	70	100
EE284	Python Programming	2	2	30	70	100
IT283	Web Designing & UI/UX	2	2	30	70	100
ME281.01	Engineering Drawing	2	2	30	70	100
PH233.01	Fundamentals of Packaging	2	2	30	70	100
PD260.01	Basic Laboratory Techniques	2	2	30	70	100
NR251.01	First Aid & Life Support	2	2	30	70	100
PT191.01	Health Promotion and Fitness	2	2	30	70	100
CA224	Introduction to Web Designing	2	2	30	70	100
BM231	Banking and Insurance	2	2	30	70	100
Total		2	2	30	70	100
Total credits: 2, Total marks: 100						

SEMESTER-IV
SCHEME OF TEACHING

SCHEME OF EVALUATION

Course Code	Name of the Course	Marks Distribution			Total	
		University (End Semester Exam)	Institute			
			Sessional Exams	Continuous Mode		
BPH4001	Pharmaceutical Organic Chemistry-III (Theory)	75	15	10	100	
BPH4002	Biochemistry (Theory)	75	15	10	100	
BPH4003	Physical Pharmaceutics-II (Theory)	75	15	10	100	
BPH4004	Pharmacology-I (Theory)	75	15	10	100	
BPH4005	Pharmacognosy-I (Theory)	75	15	10	100	
BPH4002P	Biochemistry (Practical)	35	10	05	50	
BPH4003P	Physical Pharmaceutics-II (Practical)	35	10	05	50	
BPH4004P	Pharmacology-I (Practical)	35	10	05	50	
BPH4005P	Pharmacognosy-I (Practical)	35	10	05	50	
HS111.02 B	Human Values and Professional Ethics (Practical)	70	30		100	
---	University elective*	70	30		100	
Total		655	245		900	

* University elective courses

Elective Course		Credits	Total hours	Examination scheme (Practical)		
Code	Name	Practical	--	Internal	External	Total
EC282.01	Prototyping Electronics with Arduino	2	2	30	70	100
CE282.01	Web Designing	2	2	30	70	100
CL282.01	Basics of Environmental Impact Assessment	2	2	30	70	100
EE287	MATLAB Programming	2	2	30	70	100
EE288	Maintenance of Household Apparatus	2	2	30	70	100
IT284	Data Visualization	2	2	30	70	100
ME282.01	Material Science	2	2	30	70	100
PH238.02	Cosmetics in daily life	2	2	30	70	100
NR261.01	Life Style Diseases & Management	2	2	30	70	100
PT192.01	Occupational Health & Ergonomics	2	2	30	70	100
CA225	Programming the Internet	2	2	30	70	100
BM241	Health Care Management	2	2	30	70	100
Total		2	2	30	70	100
Total credits: 2, Total marks: 100						

SEMESTER-V
SCHEME OF TEACHING

SCHEME OF EVALUATION

Course code	Name of the course	Marks Distribution			Total	
		University (End Semester Exam)	Sessional Exams			
			Marks	Continuous Mode		
BPH5001	Medicinal Chemistry-I	75	15	10	100	
BPH5002	Industrial Pharmacy-I (Theory)	75	15	10	100	
BPH5003	Pharmacology-II (Theory)	75	15	10	100	
BPH5004	Pharmacognosy-II (Theory)	75	15	10	100	
BPH5005	Pharmaceutical Jurisprudence (Theory)	75	15	10	100	
BPH5001P	Medicinal Chemistry-I	35	10	5	5	
BPH5002P	Industrial Pharmacy-I	35	10	5	5	
BPH5003P	Pharmacology-II (Practical)	35	10	5	5	
BPH5004P	Pharmacognosy-II (Practical)	35	10	5	5	
HS131.02 B	Communication and Soft Skills (Practical)	70	30	-	10	
Total		585	145	70	800	

SEMESTER-VI
SCHEME OF TEACHING

SCHEME OF EVALUATION

Course code	Name of the course	Marks Distribution			Total
		University (End Semester Exam)	Sessional Exams		
			Marks	Continuous Mode	
BPH6001	Medicinal Chemistry-II	75	15	10	100
BPH6002	Pharmacology-III (Theory)	75	15	10	100
BPH6003	Herbal Drug Technology	75	15	10	100
BPH6004	Industrial Pharmacy-II (Theory)	75	15	10	100
BPH6005	Pharmaceutical Biotechnology (Theory)	75	15	10	100
BPH6006	Instrumental Methods of Analysis (Theory)	75	15	10	100
BPH6002P	Pharmacology-III (Practical)	35	10	5	50
BPH6003P	Herbal Drug Technology (Practical)	35	10	5	50
BPH6006P	Instrumental Methods of Analysis (Practical)	35	10	5	50
HS132.02 B	Contributory Personality Development (Practical)	70	30	-	100
Total		625	150	75	850

SEMESTER-VII
SCHEME OF TEACHING

* The subject experts at college level shall conduct examination.

SCHEME OF EVALUATION

Course code	Name of the course	Marks Distribution			
		University (End Semester Exam)	Sessional Exams		Total
			Marks	Continuous Mode	
BPH7001	Medicinal Chemistry-III	75	15	10	100
BPH7002	Quality Assurance (Theory)	75	15	10	100
BPH7003	Biopharmaceutics and Pharmacokinetics (Theory)	75	15	10	100
BPH7004	Pharmacy Practice (Theory)	75	15	10	100
BPH7005	Novel Drug Delivery System (Theory)	75	15	10	100
BPH7006	Practice School*	125	-	25	150
BPH7007	Entrepreneurship for pharma professionals (Theory)*	-	50	-	50
BPH7001P	Medicinal Chemistry-III (Practical)	35	10	5	50
BPH7007P	Entrepreneurship for Pharma Professionals (Project)	80	20	-	100
Total		615	155	80	850

* The subject experts at college level shall conduct examination.

SEMESTER-VIII

SCHEME OF

TEACHING

SCHEME OF EVALUATION

Course Code	Name of the course	Marks Distribution			Total
		University (End Semester Exam)	Sessional Exams	Continuous Mode	
BPH8001	Biostatistics and Research Methodology (Theory)	75	10	15	100
BPH8002	Social and Preventive Pharmacy	75	10	15	100
BPH8003	Pharma Marketing Management				
BPH8004	Pharmaceutical Regulatory Science (Theory)				
BPH8005	Pharmacovigilance (Theory)				
BPH8006	Quality Control and Standardization of Herbals (Theory)				
BPH8007	Computer Aided Drug Design				
BPH8008	Cell and Molecular Biology				
BPH8009	Cosmetic Science (Theory)				
BPH8010	Pharmacological Screening Methods (Theory)				
BPH8011	Advanced Instrumentation Techniques (Theory)				
BPH8012	Dietary Supplements and Nutraceuticals (Theory)				
BPH8013	Pharmaceutical Product Development (Theory)				
BPH8014	Project Work	150	-	-	1
Total		450	40	60	550

Table-IX: Semester wise credits distribution

Semester	Credit Points
I	27/29\$/30#
II	26
III	29
IV	32
V	30
VI	32
VII	31
VIII	22
Co-Curricular Activities (*Certificate course from SWAYAM, NPTEL etc. prescribe by various government agencies, Attending conferences, scientific presentations, publications, industry training and other scholarly activities) and Extra Curricular Activities	02*
Total credit points for the program	Minimum: 229/231\$/232# Maximum: 231/233\$/234#

*The credit points assigned for a selection of certificate course/s from SWAYAM, NPTEL, etc. prescribe by Various Government Agencies and submit a copy of course completion certificate, shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

\$Applicable ONLY for the students studied Physics/Chemistry/Botany/Zoology at HSC and appearing for Remedial Mathematics course.

#Applicable ONLY for the students studied Mathematics/Physics/Chemistry at HSC and appearing for Remedial Biology course.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

SYLLABI

(Semester – I)

CHAROTAR UNIVERSITY OF SCIENCE
AND TECHNOLOGY

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH1001: HUMAN ANATOMY AND PHYSIOLOGY-I (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction to human body	10
	Cellular level of organization	
	Tissue level of organization	
2	Integumentary system	10
	Skeletal system	
	Joints	
3	Nervous system	10
4	Peripheral nervous system	8
5	Endocrine system	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	<p>Introduction to human body: Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.</p> <p>Cellular level of organization: Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signalling pathway activation by extracellular signal molecule, Forms of intracellular signalling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine</p> <p>Tissue level of organization: Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues</p>	10 Hours	22.22%

2.	Integumentary system: Structure and functions of skin Skeletal system: Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction	10 Hours	22.22%
	Joints: Structural and functional classification, types of joints movements and its articulation		
3.	Nervous system: Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters. Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)	10 Hours	22.22%
4.	Peripheral nervous system: Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves. Special senses: Structure and functions of eye, ear, nose and tongue and their disorders.	8 Hours	17.77%
5.	Endocrine system: Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe gross morphology, structure and functions of various organs of the human body.
CO2	write various homeostatic mechanisms and their imbalances.
CO3	identify, draw and differentiate various tissues and organs of different systems of human body.
CO4	summarize coordinated working pattern of different organs of each system.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	-	3	-	-	-	-	-	-	-	-
CO4	3	-	3	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH1001P: HUMAN ANATOMY AND PHYSIOLOGY-I (Practical)

Total hours: 60 Hr

Outline of the Course:

Sr. No.	Title of the Practical
1	Study of compound microscope
2	Microscopic study of epithelial and connective tissue
3	Microscopic study of muscular and nervous tissue
4	Identification of axial bones
5	Identification of appendicular bones
6	To study the integumentary and special senses using specimen, models, etc.
7	To study the nervous system using specimen, models, etc.
8	To study the endocrine system using specimen, models, etc
9	To demonstrate the general neurological examination
10	To demonstrate the function of olfactory nerve
11	To examine the different types of taste.
12	To demonstrate the visual acuity
13	To demonstrate the reflex activity
14	Recording of body temperature
15	To demonstrate positive and negative feedback mechanism

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	Distinguish various tissues by observing morphology and structure through microscopy
CO2	identify various organs of the different body systems and describe their functions
CO3	identify various bones
CO4	describe physiology and functioning of various sensory organs

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	3	-	-	-	-	-	-	-
CO2	3	-	3	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-
CO4	3	-	-	3	-	-	-	-	-	-	-

Recommended Study Material:

❖ Textbook:

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brother's medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill, Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
4. Text book of Medical Physiology- Arthur C, Guyton and John.E. Hall. Miamisburg, OH, U.S.A
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

❖ Reference book:

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Textbook of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterjee, Academic Publishers Kolkata

❖ Web Materials:

1. <http://www.visiblebody.com/>
2. <http://www.getbodysmart.com/>
3. <http://www.innerbody.com>
4. <http://libguides.middlesex.mass.edu/>
5. http://wps.aw.com/bc_marieb_ehap_8/
6. http://sciology.org/wiki/index.php/Anatomy_and_Physiology

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH1002: PHARMACEUTICAL ANALYSIS-I (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Pharmaceutical analysis	10
	Errors	
2	Acid base titration	10
	Non aqueous titration	
3	Precipitation titrations	10
	Complexometric titration	
	Gravimetry	
4	Redox titrations	8
5	Electrochemical methods of analysis	7
	Conductometry	
	Potentiometry	
	Polarography	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Pharmaceutical analysis, Errors Definition and scope Different techniques of analysis. Methods of expressing concentration Primary and secondary standards. Preparation and standardization of various molar and normal solutions- oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate. Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures.	10 Hours	22.22%
2.	Acid base titration, Non-aqueous titration Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves. Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl.	10 Hours	22.22%

3.	Precipitation titrations, Complexometric titration, Gravimetry Mohr's method, Volhard's, Modified. Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.	10 Hours	22.22%
	Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, estimation of barium sulphate.		
4.	Redox titrations Concepts of oxidation and reduction Types of redox titrations (Principles and applications) Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate.	8 Hours	17.77%
5.	Electrochemical methods of analysis, Conductometry, Potentiometry, Polarography Introduction, conductivity cell, conductometric titrations, applications. Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications. Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe principle and applications of various types of volumetric and electrochemical methods of pharmaceutical analysis.
CO2	describe principle and applications of gravimetric analysis.
CO3	perform calcluations necessary to prepare desired concentration of standard, test solutions and calculation related to titration curve for various types of volumetric methods of pharmaceutical analysis.
CO4	describe various errors to be involved in pharmaceutical analysis, their sources and proposing mitigation stategies for analytical errors.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	-	-	-	-	-	-	3
CO2	3	-	3	-	-	-	-	-	-	-	3
CO3	3	-	3	-	-	-	-	-	-	-	3
CO4	3	-	3	-	-	-	-	-	-	-	3

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH1002P: PHARMACEUTICAL ANALYSIS (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	Title
1	Preparation and standardization of (a) Sodium hydroxide (b) Sulphuric acid (c) Sodium thiosulfate (d) Potassium permanganate (e) Ceric ammonium sulphate
	Assay of the following compounds along with standardization of titrant (a) Ammonium chloride by acid base titration (b) Ferrous sulphate by Cerimetry (c) Copper sulphate by Iodometry (d) Calcium gluconate by Complexometry (e) Hydrogen peroxide by Permanganometry (f) Sodium benzoate by non-aqueous titration (g) Sodium Chloride by precipitation titration
	Determination of Normality by electro-analytical methods (a) Conductometric titration of strong acid against strong base (b) Conductometric titration of strong acid and weak acid against strong base (c) Potentiometric titration of strong acid against strong base
2	
3	

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	prepare and standardise various titrants
CO2	perform volumetric analysis
CO3	perform electrochemical analysis of compounds using laboratory instruments
CO4	describe principle and various terminologies related to volumetric and electrochemical analysis.
CO5	perform necessary calculations, report the concentration of analyte and draw conclusion.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	-	-	-	-	-	-	-	3
CO2	3	3	3	-	-	-	-	-	-	-	3
CO3	3	3	3	-	-	-	-	-	-	-	3
CO4	3	-	3	-	-	-	-	-	-	-	3
CO5	3	-	3	-	-	-	-	3	-	-	-

Recommended Study Material:**❖ Textbook/ Reference book**

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone
2. Press of University of London
3. A.I. Vogel, Textbook of Quantitative Inorganic analysis
4. P. Gundu Rao, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. John H. Kennedy, Analytical chemistry principles
7. Indian Pharmacopoeia.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH1003: PHARMACEUTICS-I (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Historical background and development of profession of pharmacy	10
	Dosage forms	
	Prescription	
	Posology	
2	Pharmaceutical calculations	10
	Powders	
	Liquid dosage forms	
3	Monophasic liquids	10
	Biphasic liquids	
	Suspensions	
	Emulsions	
4	Suppositories	8
	Pharmaceutical incompatibilities	
5	Semisolid dosage forms	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Historical background and development of profession of pharmacy, Dosage forms, Prescription, Posology	10 Hours	22.22%
	History of profession of pharmacy in India in relation to pharmacy education, industry and organization, pharmacy as a career, pharmacopoeias: introduction to IP, BP, USP and extra pharmacopoeia. Introduction to dosage forms, classification, and definitions. Definition, parts of prescription, handling of prescription and errors in prescription. Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.		
2.	Pharmaceutical calculations, Powders, Liquid dosage forms	10 Hours	22.22%
	Weights and measures – Imperial and metric system, calculations involving percentage solutions, alligation, proof		

	spirit and isotonic solutions based on freezing point and molecular weight. Definition, classification, advantages and disadvantages, Simple and compound powders – official preparations, dusting powders, effervescent, efflorescent, and hygroscopic powders, eutectic mixtures. Geometric dilutions. Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques		
3.	Monophasic liquids, Biphasic liquids, suspensions, Emulsions	10 Hours	22.22%
	Definitions and preparations of gargles, mouthwashes, throat paint, eardrops, nasal drops, enemas, syrups, elixirs, liniments and lotions. Definition, advantages and disadvantages, classifications, Preparation of suspensions; flocculated and deflocculated suspension and stability problems and methods to overcome. Definition, classification, emulsifying agent, test for the identification of type of emulsion, methods of preparation and stability problems and methods to overcome.		
4.	Suppositories, Pharmaceutical incompatibilities	8 Hours	17.77%
	Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value and its calculations, evaluation of suppositories. Definition, classification, physical, chemical, and therapeutic incompatibilities with examples.		
5.	Semisolid dosage forms	7 Hours	15.55%
	Definitions, classification, mechanisms, and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosages forms.		

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	summarize the history of profession of pharmacy and describe pharmacopoeias
CO2	describe the basics of different dosage forms, pharmaceutical incompatibilities and compute pharmaceutical calculations.
CO3	interpret and analyze the prescription.
CO4	describe and differentiate selected classes of conventional dosage forms

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	-	3	2	-	3	-	-
CO2	3	-	3	-	-	-	-	-	-	-	3
CO3	3	-	3	-	-	3	-	-	3	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH1003P: PHARMACEUTICS-I (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	Title of the unit
1	Syrups
	Syrup IP
	Paracetamol paediatric syrup
2	Elixirs
	Piperazine citrate elixir
	Paracetamol paediatric elixir
3	Linctus
	(a) Simple Linctus BPC
4	Solutions
	(a) Strong solution of ammonium acetate
	(b) Cresol with soap solution
5	Suspensions
	(a) Calamine lotion
	(b) Magnesium Hydroxide mixture
	(c) Emulsions
	(d) Turpentine Liniment
	(e) Liquid paraffin emulsion
6	Powders and Granules
	(a) ORS powder (WHO)
	(b) Effervescent granules
	(c) Dusting powder
7	Suppositories
	(a) Glycero gelatin suppository
	(b) Soap glycerin suppository
8	Semisolids
	(a) Sulphur ointment
	(b) Non staining iodine ointment with methyl salicylate
	(c) Bentonite gel

Course Outcome (COs):

At the end of the course, the students would be able to;

CO1	rationalize the formula and prepare solid dosage forms
CO2	prepare and evaluate different semi solid dosage forms
CO3	prepare and evaluate different liquid dosage forms

CO4

analyze the problem, communicate suggested solution and interprete the results

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	-	-	-	-	-	-	-
CO2	3	-	3	-	-	-	-	-	-	-	-
CO3	3	-	3	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-	-	-	2	-	-	-

Recommended Study Material:**❖ Textbook:**

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
12. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH1004: PHARMACEUTICAL INORGANIC CHEMISTRY (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Impurities in pharmaceutical substances	10
	General methods of preparation	
	Prescription	
	Posology	
2	Acids, Bases and Buffers	10
	Major extra and intracellular electrolytes	
	Dental products	
3	Gastrointestinal agents	10
	Acidifiers	
	Antacid	
	Cathartics	
	Antimicrobials	
4	Miscellaneous compounds Expectorants	8
	Emetics	
	Haematinics	
	Poison and Antidote	
	Astringents	
5	Radiopharmaceuticals	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Impurities in pharmaceutical substances, General Method of preparations	10 Hours	22.22%
	History of Pharmacopoeia, sources and types of impurities, principle involved in the limit test for chloride, sulphate, iron, arsenic, lead and heavy metals, modified limit test for chloride and sulphate.		
2.	Acids, Bases and Buffers, Major extra and intracellular electrolytes, Dental products	10 Hours	22.22%
	Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems,		

Assay for the compounds superscripted with asterisk(*), properties and medicinal uses of inorganic compounds belonging to the following classes

	preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations, and methods of adjusting isotonicity. Major extra and intracellular electrolytes: Functions of major physiological ions, electrolytes used in the replacement therapy: sodium chloride*, potassium chloride, calcium gluconate* and oral rehydration salt (ORS), physiological acid base balance. Dental products: Dentifrices, role of fluoride in the treatment of dental caries, desensitizing agents, calcium carbonate, sodium fluoride, and zinc eugenol cement.		
3.	Gastrointestinal agents, Acidifiers, Antacid, Cathartics, Antimicrobials Acidifiers: Ammonium chloride* and dil. HCl Antacid: Ideal properties of antacids, combinations of antacids, sodium bicarbonate*, aluminum hydroxide gel, magnesium hydroxide mixture Cathartics: Magnesium sulphate, sodium orthophosphate, kaolin and bentonite Antimicrobials: Mechanism, classification, potassium permanganate, boric acid, hydrogen peroxide*, chlorinated lime*, iodine and its preparations	10 Hours	22.22%
4.	Miscellaneous compounds Expectorants, Emetics, Haematinics, Poison and Antidote, Astringents Expectorants: Potassium iodide, ammonium chloride*. Emetics: Copper sulphate*, sodium potassium tartarate Haematinics: Ferrous sulphate*, ferrous gluconate Poison and Antidote: Sodium thiosulphate*, activated charcoal, sodium nitrite Astringents: Zinc sulphate, potash alum	8 Hours	17.77%
5.	Radiopharmaceuticals Radio activity, measurement of radioactivity, properties of α , β , γ radiations, half-life, radio isotopes and study of radio isotopes - sodium iodide I^{131} . Storage conditions, precautions and pharmaceutical application of radioactive substances.	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	suggest and rationalize the use of selected classes of inorganic compounds
CO2	summarize the application of buffers and determine the amount of chemicals required to make isotonic solutions
CO3	classify various sources of contamination in pharmaceuticals
CO4	describe limit test and its significance
CO5	interpret monograph of selected inorganic pharmaceutical compounds
CO6	describe basics of radio pharmaceuticals and their therapeutic as well as diagnostic applications

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	3	-	-	-	-	-	1	-	-
CO3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	-	3	-	-	-	-	-	1	-	-
CO5	3	-	3	-	-	-	-	-	1	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH1004P: PHARMACEUTICAL INORGANIC CHEMISTRY
(Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	Title of the Practical
1	Limit tests for following ions (a) Limit test for chlorides and sulphates (b) Modified limit test for chlorides and sulphates (c) Limit test for iron (d) Limit test for heavy metals (e) Limit test for lead (f) Limit test for arsenic
	Identification test (a) Magnesium hydroxide (b) Ferrous sulphate (c) Sodium bicarbonate (d) Calcium gluconate (e) Copper sulphate
	Test for purity (a) Swelling power of Bentonite (b) Neutralizing capacity of aluminium hydroxide gel (c) Determination of potassium iodate and iodine
	Preparation of inorganic pharmaceuticals (a) Boric acid (b) Potash alum (c) Ferrous sulphate

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	perform limit test as per the methods given in IP
CO2	identify given inorganic compounds through chemical tests
CO3	perform quantitative analysis of selected inorganic compounds
CO4	prepare inorganic pharmaceuticals following pharmacopoeial procedures
CO5	interpret the results from experimental data and prepare report

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	-	-	-	-	-	1	-	2
CO2	2	3	3	-	-	-	-	-	-	-	-
CO3	2	3	3	-	-	-	-	-	-	-	-
CO4	2	3	3	-	-	-	-	-	1	-	2
CO5	-	-	2	-	-	-	-	3	-	-	-

Recommended Study Material:**❖ Textbook:**

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4 th edition.
2. A.I. Vogel, Textbook of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3 rd Edition
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
7. Indian Pharmacopoeia.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH1005: REMEDIAL BIOLOGY (Theory)

Total hours: 30 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Living world	7
	Morphology of flowering plants	
2	Body fluids and circulation	7
	Digestion and absorption	
	Breathing and respiration	
3	Excretory products and their elimination	7
	Neural control and coordination	
	Chemical coordination and regulation	
	Human reproduction	
4	Plants and mineral nutrition	5
	Photosynthesis	
5	Plant respiration	4
	Plant growth and development	
	Cell - The unit of life	
	Tissues	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Living world, Morphology of Flowering plants Definition and characters of living organisms, diversity in the living world, Binomial nomenclature, five kingdoms of life and basis of classification. Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus. Morphology of different parts of flowering plants – root, stem, inflorescence, flower, leaf, fruit, seed, general anatomy of root, stem, leaf of monocotyledons and dicotyledones.	7 Hours	23.33%
2.	Body fluids and circulation, Digestion and Absorption, Breathing and respiration Composition of blood, blood groups, coagulation of blood, Composition and functions of lymph, human circulatory system, structure of human heart and blood vessels, cardiac cycle, cardiac output and ECG. Human alimentary canal and digestive glands, role of digestive enzymes, digestion, absorption and assimilation of digested food.	7 Hours	23.33%

	Human respiratory system, mechanism of breathing and its regulation, exchange of gases, transport of gases and regulation of respiration, respiratory volumes.		
3.	Excretory products and their elimination, Neural control and coordination, Chemical coordination and regulation, Human reproduction Modes of excretion, human excretory system- structure and function, urine formation, rennin angiotensin system. Definition and classification of nervous system, structure of a neuron, generation and conduction of nerve impulse, structure of brain and spinal cord, functions of cerebrum, cerebellum, hypothalamus and medulla oblongata. Endocrine glands and their secretions, functions of hormones secreted by endocrine glands. Parts of female reproductive system, parts of male reproductive system, spermatogenesis and oogenesis, menstrual cycle.	7 Hours	23.33%
4.	Plants and mineral nutrition, Photosynthesis Essential mineral, macro and micronutrients. Nitrogen metabolism, nitrogen cycle, biological nitrogen fixation. Autotrophic nutrition, photosynthesis, photosynthetic pigments, factors affecting photosynthesis.	5 Hours	16.66%
5.	Plant respiration, Plant growth and development, Cell - The unit of life, Tissues Respiration, glycolysis, fermentation (anaerobic). Phases and rate of plant growth, condition of growth, introduction to plant growth regulators. Structure and functions of cell and cell organelles. Cell division. Definition, types of tissues, location and functions.	4 Hours	13.33%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	identify diversity of living organism and its characteristics
CO2	describe basics of various systems of human body
CO3	define essential requirement growth and development of plants
CO4	describe different types of cells and tissues

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH1005P: REMEDIAL BIOLOGY (Practical)

Total hours: 30 Hr

Outline of the course:

Sr. No.	Title of the Practical
1	Introduction to experiments in biology
	(a) Morphology of flowering plants
	(b) Study of microscope
	(c) Section cutting techniques
	(d) Mounting and staining
	(e) Permanent slide preparation
2	Study of cell and its inclusions
3	Study of stem, root, leaf and its modifications
4	Detailed study of frog by using computer models
5	Microscopic study and identification of tissues
6	Identification of bones
7	Determination of blood group
8	Determination of blood pressure
9	Determination of tidal volume

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	differentiate various cells and tissues through histological examination
CO2	identify various types of cells inclusion
CO3	assess blood pressure, blood group and tidal volume
CO4	identify different bones of human body
CO5	interpret the results from experimental data and prepare report

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	-	-	-	3	-	-	-

Recommended Study Material:

❖ Reference book:

1. Practical human anatomy and physiology. by S.R.Kale and R.R.Kale.
2. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokane and S.P.Shriwastava.
3. Biology practical manual according to National core curriculum. Biology forum of Karnataka. Prof .M.J.H.Shafi

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
MTH1001: REMEDIAL MATHEMATICS (Theory)

Total hours: 30 Hr

Outline of the course:

No.	Unit	Minimum number of hours
1	Sets, Relations and Functions	6
2	Trigonometry	8
3	Limit, Continuity and Differentiation	8
4	Integration	8
Total		30

Detailed Syllabus:

No.	Unit details	Contact hours	Approx. Weightage %
1	Sets, Relations and Functions Sets, number systems (real and complex numbers). Cartesian product of sets, relation. Functions and their types: Types of function: one-one, many-one, into, onto. Classification of function: algebraic, transcendental-exponential and logarithmic functions. Visualization of graphs of standard functions. Application of logarithms in pharmaceutical computations.	6 hours	20%
2	Trigonometry Measurement of angle and trigonometric functions, trigonometric-ratios, addition, subtraction and transformation formulae, trigonometric-ratios of multiple, submultiple, allied and certain angles.	8 hours	26.66%
3	Limit, Continuity and Differentiation Limits of functions and evaluation. Continuity of functions. Differentiation, derivatives of standard functions and evaluation, derivative as a rate of change, visualization of graphs of continuous and differentiable functions	8 hours	26.66%
4	Integration Indefinite integrals (primitives / anti derivatives), primitives of standard functions, methods of integration definite integral, integration as Area under the curve	8 hours	26.66%

At the end of the course, the students would be able to

CO1	understand basic concepts of functions of single variable and characteristics (types) of function through plots. Solution of equations									
CO2	understand the algebra of matrices, basic concept of statistics, computing descriptive statistics.									
CO3	understand the concept of Integration and differentiation for future need									

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	-	-	3
CO2	-	-	-	-	-	-	-	-	-	-	3
CO3	-	-	-	-	-	-	-	-	-	-	3

Recommended study materials:

1. Kreyszig, Erwin. Advanced engineering mathematics. John Wiley & Sons, 2010.
2. Stewart, James. "Calculus: Early Transcendentals, 6E." Belmont, CA: Thompson Brooks/Cole (2006).
3. Wylie, C. R., and L. C. Barrett. "Advanced Engineering Mathematics." McGraw-Hill, 1982
4. Greenberg, Michael D. Advanced engineering mathematics. Prentice-Hall, 1988.
5. Thomas, G. B., and R. L. Finney. "Calculus with Analytic Geometry (9th Edition), 1996.", Addison Wesley Publishing.
6. Stewart, James, Lothar Redlin, and Saleem Watson. Algebra and trigonometry. Nelson Education, 2015.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
HS1001: COMMUNICATION SKILLS (Theory)

Total hours: 30 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Communication skills	7
	Barriers to communication	
	Perspectives in communication	
2	Elements of communication	7
	Communication styles	
3	Basic listening skills	7
	Effective written communication	
	Writing effectively	
4	Interview gkills	5
5	Group discussion	4

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Communication Skills, Barriers to communication, Perspectives in Communication Communication Skills: introduction, definition, the importance of communication. The communication process – source, message, encoding, channel, decoding, receiver, feedback, context. Barriers to communication: physiological barriers, physical barriers, cultural barriers, language barriers, gender barriers, interpersonal barriers, psychological barriers, emotional barriers. Perspectives in communication: introduction, visual perception, language, other factors affecting our perspective - past experiences, prejudices, feelings, environment.	7 Hours	23.33%
2.	Elements of Communication, Communication Styles Elements of communication: introduction, face to face communication - tone of voice, body language (non-verbal communication), verbal communication, physical communication.	7 Hours	23.33%

	Communication styles: introduction, the communication styles matrix with example for each -direct communication style, spirited communication style, systematic communication style, considerate communication style.		
3.	Basic Listening Skills, Writing Effectively, Effective Written Communication Basic listening skills: introduction, self-awareness, active listening, becoming an active listener, listening in difficult situations. Writing effectively: introduction, when and when not to use written communication - complexity of the topic, amount of discussion required, shades of meaning, formal communication. Effective written communication: subject lines, put the main point first, know your audience, organization of the message.	7 Hours	23.33%
4.	Interview Skills, Giving Presentations Purpose of an interview, Do's and Dont's of an interview. Dealing with fears, planning your presentation, structuring your presentation, delivering your presentation, techniques of delivery.	5 Hours	16.66%
5.	Group Discussion Introduction, communication skills in group discussion, do's and dont's of group discussion.	4 Hours	13.33%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	Understand the behavioural needs for a pharmacist to function effectively in the areas of pharmaceutical operation
CO2	Identify leadership qualities and essential skills
CO3	Summarize Verbal and Non-Verbal communication effectively

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	3	-	-	3
CO2	-	-	-	-	-	-	-	3	-	-	-
CO3	-	-	-	-	-	-	-	3	-	-	3

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
HS1001P: COMMUNICATION SKILLS (Practical)

Total hours: 30 Hr

Outline of the course:

Sr. No.	Title of the Practical
1	Basic communication covering the following topics (a) Meeting people (b) Asking questions (c) Making friends (d) What did you do? (e) Do's and Dont's
	Pronunciations covering the following topics (a) Pronunciation (consonant sounds) (b) Pronunciation (vowel sounds)
	Advanced Learning (a) Listening comprehension / direct and indirect speech (b) Figures of speech (c) Effective communication writing skills (d) Effective writing (e) Interview handling skills (f) E-Mail etiquette (g) Presentation Skills

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	summarize basic communication skills
CO2	differentiate consonant and vowel sounds for proper pronunciation
CO3	communicate effectively using various soft skills

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	3	-	-	3
CO2	-	-	-	-	-	-	-	1	-	-	-
CO3	-	-	-	-	-	-	-	3	-	-	3

Recommended Study Material:

❖ Textbook:

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2 nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1 st Edition, Oxford Press, 2011
3. Organizational Behaviour, Stephen. P. Robbins, 1 st Edition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1 st Edition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala
6. Swamy Ramesh, 5 thEdition, Pearson, 2013 7. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konar nira, 2 ndEdition, New arrivals
8. PHI, 2011 9. Personality development and soft skills, Barun K Mitra, 1 st Edition, Oxford Press, 10. 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1 st Edition, Mc Graw 12. Hill Education, 2011
11. Effective communication, John Adair, 4 th Edition, Pan Mac Millan,2009
12. Bringing out the best in people, Aubrey Daniels, 2 nd Edition, Mc Graw Hill, 1999

FACULTY OF PHARMACY

Bachelor of Pharmacy Programme

SYLLABI

(Semester – II)

**CHAROTAR UNIVERSITY OF SCIENCE
AND TECHNOLOGY**

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH2001: HUMAN ANATOMY AND PHYSIOLOGY-II (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Body fluids and blood	10
	Lymphatic system	
2	Cardiovascular system	10
3	Digestive system	6
	Respiratory system	
4	Respiratory system	10
	Urinary system	
5	Reproductive system	9
	Introduction to genetics	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Body fluids and blood: Body fluids, composition, and functions of blood, hemopoiesis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, reticuloendothelial system. Lymphatic system: Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system.	10 Hours	22.22%
2.	Cardiovascular system: Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heartbeat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram, and disorders of heart.	10 Hours	22.22%
3.	Digestive system: Anatomy of GI Tract with special reference to anatomy and functions of stomach, (acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands,	6 Hours	13.33%

	pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT. Respiratory system: Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration.		
4.	Respiratory system: Lung volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods. Urinary system: Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney	10 Hours	22.22%
5.	Reproductive system: Anatomy of male and female reproductive system, functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy, and parturition. Introduction to genetics: Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.	9 Hours	20%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe various biological fluids
CO2	describe gross morphology, structure and functions of various organs of the human body
CO3	identify, draw and differentiate various tissues and organs of different systems of human body
CO4	describe structure and role of genetic material in protein synthesis and inheritance

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	3
CO3	3	-	3	3	-	-	-	-	-	-	-
CO4	3	-	3	3	-	-	-	-	-	-	3

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH2001P: HUMAN ANATOMY AND PHYSIOLOGY-II (Practical)

Total hours: 60 Hours

Outline of the course:

Sr. No.	Title of the Practical
1.	Introduction to hemocytometry
2.	Enumeration of white blood cell (WBC) count
3.	Enumeration of total red blood corpuscles (RBC) count
4.	Determination of bleeding time
5.	Determination of clotting time
6.	Estimation of hemoglobin content
7.	Determination of blood group
8.	Determination of erythrocyte sedimentation rate (ESR)
9.	Determination of heart rate and pulse rate
10.	Recording of blood pressure
11.	Determination of tidal volume and vital capacity
12.	Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens
13.	Recording of basal mass index
14.	Study of family planning devices and pregnancy diagnosis test
15.	Demonstration of total blood count by cell analyser
16.	Permanent slides of vital organs and gonads

Course Outcome (COs):

At the end of the course, the students would be able to;

CO1	summarize physiological characteristics of various systems
CO2	perform various tests related to blood cells counts and coagulation parameters
CO3	describe diagnostic parameters related to blood and haemodynamics
CO4	identify and describe functionality of various devices for family planning and pregnancy diagnostic tests
CO5	identify and differentiate various vital organs on the basis of histology

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	3	3	-	-	-	-	-	-	-
CO3	3	-	3	3	-	-	-	-	-	-	3
CO4	3	-	3	-	-	-	-	-	3	-	-
CO5	-	-	3	3	-	-	-	3	-	-	-

Recommended Study Material:**❖ Textbook:**

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brother's medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
4. Text book of Medical Physiology- Arthur C, Guyton and John.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, jaypee brother's medical publishers, New Delhi.

❖ Reference book:

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Textbook of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterjee, Academic Publishers Kolkata

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH2002: PHARMACEUTICAL ORGANIC CHEMISTRY-I (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Classification, nomenclature and isomerism	7
2	Alkanes, alkenes and conjugated dienes	10
3	Alkyl halides	10
	Alcohols	
4	Carbonyl compounds (aldehydes and ketones)	10
5	Carboxylic acids	8
	Aliphatic amines	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
General methods of preparation and reactions of compounds superscripted with asterisk (*)to be explained.			
To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences.			
1.	Classification, nomenclature, and isomerism Classification of organic compounds common and IUPAC systems of nomenclature of organic compounds (up to 10 carbons open chain and carbocyclic compounds), structural isomerism in organic compounds	7 Hours	15.57%
2.	Alkanes*, Alkenes* and Conjugated dienes* SP3 hybridization in alkanes, halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP 2 hybridization in alkenes E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidence. E1 verses E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation. Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement.	10 Hours	22.22%

3.	Alkyl halides*, Alcohols* SN1 and SN2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry, and rearrangement of carbocations. SN1 versus SN2 reactions, Factors affecting SN1 and SN2	10 Hours	22.22%
	reactions. Structure and uses of ethylchloride, chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform. Qualitative tests, structure and uses of ethyl alcohol, chlorobutanol, cetosteryl alcohol, benzyl alcohol, glycerol, propylene glycol		
4.	Carbonyl Compounds* (Aldehydes and Ketones) Nucleophilic addition, electromeric effect, Aldol condensation, crossed aldol condensation, Cannizzaro reaction, crossed Cannizzaro reaction, benzoin condensation, Perkin condensation, qualitative tests, structure and uses of formaldehyde, paraldehyde, acetone, chloral hydrate, hexamine, benzaldehyde, vanilin, cinnamaldehyde.	10 Hours	22.22%
5.	Carboxylic acids*, Aliphatic amines* Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester. Structure and uses of acetic acid, lactic acid, tartaric acid, citric acid, succinic acid. oxalic acid, salicylic acid, benzoic acid, benzyl benzoate, dimethyl phthalate, methyl salicylate and acetyl salicylic acid. Basicity, effect of substituent on basicity. Qualitative test, structure and uses of ethanolamine, ethylenediamine, amphetamine.	8 Hours	17.77%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	assign nomenclature to structure as per IUPAC system
CO2	identify the type of isomerism of the organic compound
CO3	write the reaction with their reactivity, stability and orientation
CO4	enumerate the preparations, reactions and uses of important organic compounds

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	2	-	-	-	-	-	-	-	1
CO2	3	-	2	-	-	-	-	-	-	-	1
CO3	3	-	2	-	-	-	-	-	-	-	1
CO4	2	-	2	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH2002P: PHARMACEUTICAL ORGANIC CHEMISTRY -I
(Practical)

Total hours: 60 Hours

Outline of the course:

Sr. No.	Title of the Practical
1.	Systematic qualitative analysis of unknown organic compounds like: a) Preliminary test: color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc. b) Detection of elements like nitrogen, sulphur and halogen by Lassaigne's test c) Solubility test d) Functional group test like phenols, amides/ urea, carbohydrates, amines, carboxylic acids, aldehydes and ketones, alcohols, esters, aromatic and halogenated hydrocarbons, nitro compounds and anilides e) Melting point/boiling point of organic compounds f) Identification of the unknown compound from the literature using melting point/ boiling point g) Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point. h) Minimum 5 unknown organic compounds to be analyzed systematically
2.	Preparation of suitable solid derivatives from organic compounds
3.	Construction of molecular models

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	Identify the nature of organic compounds
CO2	identify unknown organic compounds using chemical tests
CO3	prepare various derivatives of organic compounds
CO4	prepare and interpret the stereo models of organic compounds
CO5	interpret the results and draw the conclusion with rationale

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	3	3	-	-	-	-	-	-	-	-
CO2	2	3	3	-	-	-	-	-	-	-	-
CO3	2	3	3	-	-	-	-	-	-	-	-
CO4	2	-	3	-	-	-	-	-	-	-	3
CO5	-	-	2	-	-	-	-	3	-	-	-

Recommended Study Material:

❖ Textbook:

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar, Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L. Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K. Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
9. Reaction and reaction mechanism by Ahluwaliah/Chatwal.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH2003: PHARMACEUTICAL ENGINEERING (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Flow of fluids	10
	Size reduction	
	Size separation	
	Mixing	
2	Crystallization	10
	Evaporation	
	Heat transfer	
3	Drying	10
	Distillation	
4	Filtration	8
	Centrifugation	
5	Plant location, industrial hazards, and plant safety	7
	Materials of pharmaceutical plant construction, corrosion, and its prevention	
	Material handling systems	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Flow of fluids, Size Reduction, Size Separation, Mixing Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, energy losses, Orifice meter, Venturimeter, pitot tube and rotometer. Objectives, mechanisms & laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of hammer mill, ball mill, fluid energy mill, edge runner mill & end runner mill. Objectives, applications and mechanism of size separation, official standards of powders, sieves, size separation principles, construction, working, uses, merits and demerits of sieve shaker, cyclone separator, air separator, bag filter and elutriation tank. Objectives, applications and factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing.	10 Hours	22.22%

	Principles, construction, working, uses, merits and demerits of double cone blender, twin shell blender, ribbon blender, sigma blade mixer, planetary mixers, propellers, turbines, paddles and silverson emulsifier		
2.	<p>Crystallization, Evaporation, Heat Transfer</p> <p>Objectives, applications and theory of crystallization. Solubility curves, principles, construction, working, uses, merits and demerits of agitated batch crystallizer, Swenson Walker crystallizer, Krystal crystallizer, Vacuum crystallizer. Caking of crystals, factors affecting caking and prevention of caking.</p> <p>Objectives, application, and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator.</p> <p>Objectives, applications and heat transfer mechanisms. Fourier's law, heat transfer by conduction, convection and radiation. Heat interchangers and heat exchangers</p>	10 Hours	22.22%
3.	<p>Drying, Distillation</p> <p>Objectives, applications and mechanism of drying process, measurements and applications of equilibrium moisture content, rate of drying curve. Principles, construction, working, uses, merits and demerits of tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.</p> <p>Objectives, applications and types of distillation. principles, construction, working, uses, merits and demerits of (lab scale and industrial scale) Simple distillation, preparation of purified water and water for injection BP by distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation.</p>	10 Hours	22.22%
4.	<p>Filtration, Centrifugation</p> <p>Objectives, applications, theories and factors influencing filtration, filter aids, filter medias. Principle, construction, working, uses, merits and demerits of plate and frame filter, filter leaf, rotary drum filter, meta filter and cartridge filter, membrane filters and seidtz filter.</p> <p>Objectives, principle and applications of centrifugation, principles, construction, working, uses, merits and demerits of perforated basket centrifuge, non-perforated basket centrifuge, semi continuous centrifuge and super centrifuge</p>	8 Hours	17.77%

<p>5. Plant location, industrial hazards and plant safety, Materials of pharmaceutical plant construction, Corrosion and its prevention, Material handling systems</p> <p>Plant layout, utilities and services, mechanical hazards, chemical hazards, fire hazards, explosive hazards, and their safety.</p> <p>Factors affecting during materials selected for pharmaceutical plant construction, theories of corrosion, types of corrosion and their prevention. Ferrous and nonferrous metals, inorganic, and organic nonmetals.</p> <p>Objectives and applications of material handling systems, different types of conveyors such as belt, screw, and pneumatic conveyors.</p>	7 Hours	15.55%
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Course Outcome (COs):

At the end of the course, the students would be able to

CO1	summarize unit operations used in pharmaceutical industries with applications
CO2	suggest and justify appropriate equipment of the unit operations
CO3	summarize material handling techniques in pharmaceutical industry
CO4	describe preventive methods used for environmental pollution and corrosion control in pharmaceutical industries
CO5	draw and comprehend significance of pharmaceutical plant lay out design

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	3
CO2	3	-	2	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	3	-
CO5	2	3	-	-	-	-	-	3	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH2003P: PHARMACEUTICAL ENGINEERING (Practical)

Total hours: 60 Hours

Outline of the course:

Sr. No.	Title of the Practical
1.	Determination of radiation constant of brass, iron, unpainted and painted glass
2.	Steam distillation – To calculate the efficiency of steam distillation
3.	To determine the overall heat transfer coefficient by heat exchanger
4.	Construction of drying curves (for calcium carbonate and starch)
5.	Determination of moisture content and loss on drying
6.	Determination of humidity of air: i) From wet and dry bulb temperatures ii) Dew point method
7.	Description of construction working and application of pharmaceutical machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier
8.	Size analysis by sieving: To evaluate size distribution of tablet granulations –construction of various size frequency curves including arithmetic and logarithmic probability plots
9.	Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of ball mill
10.	Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment
11.	Factors affecting rate of filtration and evaporation (surface area, concentration and thickness/ viscosity)
12.	To study the effect of time on the rate of crystallization
13.	To calculate the uniformity Index for given sample by using double cone blender

Course Outcome (COs):

At the end of the course, the students would be able to;

CO1	perform unit operations involved in pharmaceutical manufacturing operations
CO2	operate and justify the equipment for unit operations
CO3	determine the heat transfer and mass transfer processes
CO4	interpret the results and draw the conclusion with rationale

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	3	2	-	-	-	-	-	-	-
CO2	2	-	3	2	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	3
CO4	-	-	3	-	-	-	-	3	-	-	-

Recommended Study Material:**❖ Textbook:**

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.
3. Unit operation of chemical engineering – McCabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann, Latest edition.
7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH2004: COMPUTER APPLICATIONS IN PHARMACY (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Number system Concept of information systems and software	9
2	Web technologies	
3	Application of computers in pharmacy	9
4	Bioinformatics	9
5	Chromatographic data analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS)	9

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Number system, Concept of Information Systems and Software Binary number system, decimal number system, octal number system, hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division. Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project	9 Hours	20%
2.	Web Technologies Introduction to HTML, XML, CSS and programming languages, introduction to web servers and server products. Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database	9 Hours	20%
3.	Application of Computers in Pharmacy	9	20%

	Drug information storage and retrieval, pharmacokinetics, mathematical model in drug design, hospital and clinical pharmacy, electronic prescribing and discharge (ep) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring	Hours	
	diagnostic system, lab-diagnostic system, patient monitoring system, pharma information system		
4.	Bioinformatics Introduction, objective of bioinformatics, bioinformatics databases, concept of bioinformatics, impact of bioinformatics in vaccine discovery	9 Hours	20%
5.	Chromatographic data analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS)	9 Hours	20%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe the concept of information system and software
CO2	classify and describe various types of databases
CO3	enlist and describe various applications of databases in pharmacy
CO4	describe various applications of softwares in pharmacy

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	2	3	-	-	-	-	-	-	3
CO2	-	-	-	-	-	-	-	-	-	-	3
CO3	2	-	3	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH2004P: COMPUTER APPLICATIONS IN PHARMACY (Practical)

Total hours: 30 Hours

Outline of the course:

Sr. No.	Title of the unit
1.	Design a questionnaire using a word processing package to gather information about a particular disease
2.	Create a HTML web page to show personal information.
3.	Retrieve the information of a drug and its adverse effects using online tools
4.	Creating mailing labels Using Label Wizard, generating label in MS WORD
5.	Create a database in MS access to store the patient information with the required fields Using access
6.	Design a form in MS Access to view, add, delete and modify the patient record in the database
7.	Generating report and printing the report from patient database
8.	Creating invoice table using – MS Access
9.	Drug information storage and retrieval using MS Access
10.	Creating and working with queries in MS Access
11.	Exporting tables, queries, forms and reports to web pages
12.	Exporting tables, queries, forms and reports to XML pages

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	generate databases using varoius tools
CO2	program to retrieve data from database
CO3	apply MS-Access for storage and retrieval of drug information
CO4	export contents to web and xml pages

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	3	-	-	-	-	-	-	2
CO2	-	-	-	3	-	-	-	-	-	-	-
CO3	2	-	-	3	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-

Recommended Study Material:

❖ Textbook:

1. Computer Application in Pharmacy – William E. Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryaganj, New Delhi - 110002

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

HS 101.02 B: COMMUNICATIVE ENGLISH

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	30/15	--	30/15	
Marks	--	100	--	100	2

Pre-requisite courses:

- Grammar and Punctuation (Free Online Course for Beginners)
<https://www.coursera.org/learn/grammar-punctuation>

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Communicative English	03
2.	Communication Functions	06
3.	Basic Communication Skills I – Listening	03
4.	Basic Communication Skills II – Reading	03
5.	Basic Communication Skills III – Speaking	06
6.	Basic Communication Skills IV – Writing	06
7.	Developing Vocabulary	03
	Total hours (Theory):	--
	Total hours (Practical):	30
	Total hours (Lab):	--
	Total hours:	30

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Introduction to Communicative English	03 Hours	10%
	English as a window language; varieties of english: British english, American english, Indian english; language variations; importance of english for academic and professional development; strategies for language acquisition; formal vs informal English		
2.	Communication Functions	06 Hours	20%
	Greeting and introducing; making requests and asking for information; expressing likes and dislikes; seeking permission; giving and taking advice; describing people, place, things;		

	retelling past events; comparing and contrasting; persuading; describing cause and effect		
3.	Basic Communication Skills I – Listening	3 Hours	10%
	Importance of listening as a language skill; basic listening skills; types of listening; barriers to listening; strategies for effective listening; listening practice		
4.	Basic Communication Skills II – Reading	3 Hours	10%
	Importance of reading as a language skill, reading strategies: skimming, scanning, intensive reading, extensive reading, strategies for effective reading comprehension, reading practice		
5.	Basic Communication Skills III – Speaking	6 Hours	20%
	Importance of speaking as a language skill, basic speaking skills; paralanguage for effective speaking; strategies for oral communication; extempore and public speaking		
6.	Basic Communication Skills IV – Writing	6 Hours	20%
	Importance of writing as a language skill; process of writing: prewriting, drafting, revision, editing, publication; seven c's of writing; sentence construction – complex, compound, paragraph development; letter writing (academic context)		
7.	Developing Vocabulary	3 Hours	10%
	High frequency vocabulary (everyday and academic use); words often confused and misused; useful phrasal verbs, idioms and proverbs, homonyms and homographs; lexical range, word games		

Course Outcome (COs):

At the end of the course, the students will be able to

CO1	communicate with people using English language functions including greetings, introductions, making and responding to requests, suggestions, invitations and apologies, conducting simple transactions in shops and offices, asking for and giving directions, etc
CO2	go through a text and identify specific and global information
CO3	become more knowledgeable about speaking strategies and speak effectively using appropriate words, expression, tone and pronunciation
CO4	be aware about various reading strategies and read and comprehend academic and non-academic prose (text).
CO5	write systematically using nuances of writing
CO6	express their opinion and likes and dislikes, advice and convince others in a more polite and accepted way.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	3	-	-	3
CO2	-	-	-	-	-	-	-	3	-	-	-
CO3	-	-	-	-	-	-	-	3	-	-	-
CO4	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation, put “-”

Recommended Study Material:**❖ Text book:**

1. Sanjay Kumar and PushpLata (Second Edition, 2015), Communication Skills, Oxford University Press, New Delhi
2. M V Rodrigues (2013), Effective Business Communication, Concept Publishing Company (P) Ltd., New Delhi
3. Krishna Mohan and Meera Banerji (2010), Developing Communication Skills, Macmillan Publications India Ltd., New Delhi

❖ Reference book:

1. Mohan and Meenakshi Raman (2006), Effective English Communication, McGraw-Hill Publishing Company Limited, New Delhi
2. Geoffrey Leech & Jan Svartvik (1994), A Communicative Grammar of English, Longman Publications, New York
3. Jones Leo (1979), Functions of English, Cambridge University Press, UK
4. European Journal of Language and Literature Studies Vol.1 Nr. 1 April 2015
5. English for Academic Purpose: A Tool for Enhancing Students' Proficiency in English Language Skills

❖ Web material:

1. <https://www.futurelearn.com/courses/language-assessment>
2. <https://www.coursera.org/learn/importance-of-listening?#syllabus>
3. <https://www.futurelearn.com/courses/english-academic-study>

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
A COURSE FROM LIBERAL ARTS

Contact Hours: 30

Credits and Schemes

Elective Course		Credits		Total hours	Examination scheme (Practical)		
Code	Name	Theory	Practical	--	Internal	External	Total
HSUS101	Liberal Arts - Painting	--	2	2	25	25	50
HSUS102	Liberal Arts - Photography	--	2	2	25	25	50
HSUS103	Liberal Arts - Sculpting	--	2	2	25	25	50
HSUS104	Liberal Arts - Pottery and Ceramic Art	--	2	2	25	25	50
HSUS105	Liberal Arts - Media and Graphic Design	--	2	2	25	25	50
HSUS106	Liberal Arts - Art and Craft	--	2	2	25	25	50
HSUS109	Liberal Arts - Dramatics	--	2	2	25	25	50
HSUS110	Liberal Arts - Contemporary Dance	--	2	2	25	25	50
HSUS111	Liberal Arts - Music (vocal)	--	2	2	25	25	50
HSUS112	Liberal Arts - Music (Instrumental) – Tabla	--	2	2	25	25	50
HSUS113	Liberal Arts - Music (Instrumental) – Guitar	--	2	2	25	25	50
HSUS114	Liberal Arts - Music (Instrumental) – Harmonium	--	2	2	25	25	50
HSUS115	Liberal Arts - Music (Instrumental) – Flute	--	2	2	25	25	50
HSUS116	Liberal Arts - Indian Classical Dance – Kathak	--	2	2	25	25	50
HSUS117	Liberal Arts - Indian Classical Dance – Bharatanatyam	--	2	2	25	25	50
Total		--	2	2	25	25	50
Total credits: 2, Total marks: 50							

Course Objectives

To help learners to

- recognize the nature of aesthetic values and explore elements of arts and aesthetics with reference to personal, cultural and civic sphere
- connect art and aesthetics with science and technology to understand and extend research and innovation for a society

Courses

Students may select **any one course** from the ones given below. However, depending upon the group size and availability of resource person(s), student's selection may be finalized by Faculty of Management Studies.

Sr. No.	Course Code	Course Title(s)	Credits
1.	HSUS101	Liberal Arts - Painting	02
2.	HSUS102	Liberal Arts - Photography	
3.	HSUS103	Liberal Arts - Sculpting	
4.	HSUS104	Liberal Arts - Pottery and Ceramic Art	
5.	HSUS105	Liberal Arts - Media and Graphic Design	
6.	HSUS106	Liberal Arts - Art and Craft	
7.	HSUS109	Liberal Arts - Dramatics	
8.	HSUS110	Liberal Arts - Contemporary Dance	
9.	HSUS111	Liberal Arts - Music (vocal)	
10.	HSUS112	Liberal Arts - Music (Instrumental) – Tabla	
11.	HSUS113	Liberal Arts - Music (Instrumental) – Guitar	
12.	HSUS114	Liberal Arts - Music (Instrumental) – Harmonium	
13.	HSUS115	Liberal Arts - Music (Instrumental) – Flute	
14.	HSUS116	Liberal Arts - Indian Classical Dance – Kathak	
15.	HSUS117	Liberal Arts - Indian Classical Dance – Bharatanatyam	

Instruction Method and Pedagogy

Teaching will be practical based on the hands-on experiences, live and interactive sessions. It may also run in the workshop mode.

Evaluation

The students will be evaluated continuously in the form of their consistent performance throughout the semester. There is no theoretical evaluation. There is just practical evaluation. The evaluation (practical) is schemed as 25 marks for internal evaluation and 25 marks for external evaluation.

Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

Learning Outcomes

At the end of the course, students will have developed the ability to enjoy, interact with and perform arts and aesthetics; and will have developed the ability and creativity to transfer sense of design and innovation in science and technology.

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS101: PAINTING

I. Credits and Schemes

Sem	Course Code	Course Name	Credits	Teaching Scheme	Evaluation Scheme				
					Theory		Practical		
				Contact Hours/Week	Internal	External	Internal	External	
II	HSUS101	Painting	02	02	--	--	25	25	50

II. Course Objectives

- To encourage/ foster creativity among the students
- To introduce students to the fundamental processes of visual perception and artistic expression
- To cultivate / spawn awareness among students about the significance of art history, art criticism and aesthetics
- To help the students understand the meanings of concept, designs, shapes, colors, medium, and format
- To give the students the firsthand experience of design, painting, colors, light, shapes, shades and other important aspects of painting
- To develop in students an understanding of major styles and contemporary issues in painting

III. Course Outline

Module No.	Title/Topic	Classroom Contact Sessions
1	An Introduction to Painting <ul style="list-style-type: none">• <i>An Introduction to Painting</i>• <i>Principles of Composition</i>• <i>Medium and Techniques of Painting</i>• <i>History of Painting: Folk Indian Painting /Western Painting</i>• <i>2D and 3D Painting</i>	02

2	Drawing from Nature and Object <ul style="list-style-type: none"> • <i>Objects of Drawing: Nature and Manmade /Artificial Objects</i> • <i>Drawing Still / Live Objects</i> • <i>Drawing from Memory</i> • <i>Drawing from Life</i> 	04
3	Colour Design and Colour Value <ul style="list-style-type: none"> • <i>Color Theory:</i> <p><i>Color wheel (primary/secondary, complementary), transparency/opacity, hue, value (intensity, brightness), chroma (saturation, purity) & temperature (warm/cold)</i></p> <ul style="list-style-type: none"> • <i>Color Contrast & Attributes:</i> <i>Interaction, harmony, psychology/mood, culture & expression</i> • <i>Media Characteristics & Surfaces:</i><i>Acrylic, oil, paper, wood & canvas</i> <i>(primed/unprimed)</i> 	06
4	Composition and Perspective <ul style="list-style-type: none"> • <i>Composition:</i> <i>Space, movement, balance, asymmetry, rhythm, shapes, proportion & lighting</i> • <i>Perspective:</i><i>An approximate reproduction</i> • <i>Types of Perspectives:</i> <i>Linear Perspective, One-point Perspective, Two-point Perspective, Three-point Perspective, Four-Point Perspective</i> 	06
5	Figure Drawing and Proportion <ul style="list-style-type: none"> • <i>Proportions of the Human Body</i> • <i>Three views – Anterior (front), Lateral (side) and Posterior (back)</i> • <i>Fundamental Proportion – The Big Three</i> 	04
6	Sketching <ul style="list-style-type: none"> • <i>Sketching and Freehand</i> • <i>Sketching Techniques</i> • <i>Sketch and Drawing Medium</i> 	04
7	Contemporary Issues in Painting <ul style="list-style-type: none"> • <i>Contemporary Indian Art</i> • <i>Pioneers of Contemporary Indian Art</i> • <i>Contemporary Issues in Painting</i> 	04
Total Hours		30

IV. Instruction Method and Pedagogy

Teaching will be practical based on the hands on experiences, live and interactive sessions. It will run in the workshop mode. Four Workshops (each of a day) will be organised during the semester.

V. Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

VI. Major Learning Outcomes

At the end of the course, a student will

1. have cultivated a sense of creativity.
2. be appreciative of art history, art criticism and aesthetics.
3. be able to recognize the elements of arts in painting.

4. have better cognizance and association of meaning of colors, shapes, and composition.
5. be able to acknowledge the principles of painting as in design and colors, concept, medium and formats.
6. have instantaneous painting experience about designing, lights, shades and colors and such other important aspects.

FACULTY OF PHARMACY

Bachelor of Pharmacy Programme

Semester-II

HSUS102: PHOTOGRAPHY

I. Credits and Schemes

Sem	Course Code	Course Name	Credits	Teaching Scheme	Evaluation Scheme					
					Contact Hours/Week	Theory		Practical		Total
						Internal	External	Internal	External	
II	HSUS102	Photography	02	02	--	--		25	25	50

II. Course Objectives

- To introduce students to the tools and techniques of photography
- To provide students a thorough understanding of the mechanism and operations of a camera and help them understand the importance of aperture, shutter speed, film speed, depth of field, movement, and light meters to create a master shot
- To enable students to come out with a final project that demonstrates a single or a unified photographic idea or technique
- To explain students varied types of photographic representation including appropriation, persona, mixed media, non-objective images and engage them into experimentation using digital media
- To make students create a portfolio demonstrating creative uses of artificial and mixed lighting situations

III. Course Outline

Module No.	Title/Topic	Classroom Contact Sessions
1	<p>An Introduction to Photography</p> <ul style="list-style-type: none"> • <i>Art, Design and Visualization</i> • <i>Basics of Photography and Various Types of Photography</i> • <i>Basics of Post Production</i> • <i>A Brief History of Photography: Early Experiments and Later Developments</i> 	03
2	<p>Camera and Operating System</p> <ul style="list-style-type: none"> • <i>Role of Camera in the Photography</i> • <i>Types of Camera</i> <i>Pin-hole, box, folding, large and medium format cameras, single lens reflex (SLR) and twin lens reflex(TLR), miniature, subminiature and instant camera</i> 	
	<ul style="list-style-type: none"> • <i>Principal Parts of Photographic Camera</i> <i>Lens, Aperture, Shutters, various types and their functions, focal plane shutter and in-between the lensshutter, shutter synchronization, self-timer</i> • <i>Types of Lenses</i> <i>Single (meniscus), achromatic, symmetrical and unsymmetrical lenses, telephoto, zoom, macro, supplementary and fish-eye lenses</i> • <i>Different Models of Camera, their Features and Operating Systems</i> • <i>Camera and Size of the Image, Speed and Power of Lens</i> 	

3	<p>Light and Shade</p> <ul style="list-style-type: none"> • <i>Reflection and refraction of light</i> • <i>Dispersion of light through a glass prism, lenses</i> • <i>Colour Filters:</i> <i>Different kinds, Red, yellow, green, neutral density, halffilters, filter factor, colour correction filter</i> • <i>Photographic Light Sources:</i> <i>Natural source, the Sun, nature and intensity of the sunlight at different times of the day, different weather conditions</i> • <i>Artificial light sources:</i> <i>Nature, intensity of different types of light sources used in photography namely; (i) Photo flood lamp, (ii) Spot light, (iii) Halogen lamp, Barn doors and snoot, lighting stands</i> • <i>Flash unit:</i> <i>Bulb flash and Electronic flash, main components, electronic flash units, studio flash, slave unit, multiple flash, computer flash, x-contact, exposure table</i> 	
4	<p>Composition</p> <ul style="list-style-type: none"> • <i>Different kinds of image formations</i> • <i>Principal focus and focal length of the lens</i> • <i>Depth of field, angle of view and perspective</i> • <i>Perspective and composition</i> • <i>Rules of composition</i> 	
5	<p>Contemporary Issues in Photography</p> <ul style="list-style-type: none"> • <i>Present Day Photography</i> • <i>Contemporary Photographers and their Contributions</i> • <i>Major Issues in Contemporary Photography</i> 	
Total Hours		

IV. Instruction Method and Pedagogy

Teaching will be practical based on the hands on experiences, live and interactive sessions. It will run in the workshop mode. Four Workshops (each of a day) will be organised during the semester.

V. Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

VI. Learning Outcomes

At the end of the course, students will be able to

- Understand, appreciate and demonstrate innovative approach, beauty and acute acumen in the area of photography
- Develop photography skills and become familiar with the functions and importance of the visual elements of nature and artificial objects
- Become independent thinkers who will contribute inventively and critically to culture through the making of art photography
- Have thorough understanding and acute sense of light and shade, composition, and

presentation of a piece of an art

- Experiment and Represent the cultivated sense and skills in Photography to the mass
- Prepare an impressive portfolio encompassing holistic approach to art and other the areas of study.

FACULTY OF PHARMACY

Bachelor of Pharmacy Programme

Semester-II

HSUS103: SCULPTING

I. Credits and Schemes

Sem	Course Code	Course Name	Credits	Teaching Scheme	Evaluation Scheme				
					Theory		Practical		
				Contact Hours/Week	Internal	External	Internal	External	
II	HSUS103	Sculpting	02	02	--	--	25	25	50

II. Course Objectives

- To promote creativity and aesthetic sense pertaining to Sculpting by introducing them to the history of sculpting, its basic concepts and contemporary techniquesand issues
- To help the students understand and develop the skill of sketching and drawingfrom life, natural and manmade objects and structures using various means like pencil, pen, ink, crayon, chalk, colour etc.
- To help them understand methods and materials of sculpture i.e. clay, plaster, cement, wood, stone, bronze, enlarging and reducing devises, welding torch etc.
- To help the students develop the sense of structure, and understand how forms achieve their structural unity through adherence to principles of physical nature of material being observed and studied (e.g. Plants, insects, minerals etc)
- To introduce the basic visual elements of 2-D and 3-D designs with emphasis on fundamentals of two and three-dimensional designs
- To acquaint the learners with various perspectives to draw and mould a sculpture
- To make the learners understand the colour theory and its practical usages
- To provide the students a sound background of the traditional and representational form in sculpture and enable them to develop their own vision

III. Course Outline

Module No.	Title/Topic	Classroom Contact Sessions
1	An Introduction to Sculpture <ul style="list-style-type: none"> <i>What Sculpture is and how it is different from other Arts</i> <i>Basic elements, techniques, and history of sculpture</i> <i>Form, Space and Basic Shapes in Sculpture</i> <i>Casting materials, moldmaking, basic wood cutting and shaping, metal work, Welding, assembling, adhesives, plaster, mixing</i> 	06
2	Fundamental Principles of Sculpture <ul style="list-style-type: none"> <i>Basic Principles of Aesthetics in Sculpture</i> <i>Visual Principles – balance, sequence, weight, and structural dynamics in sculpture</i> <i>Structural Principles and communicative possibilities of sculpture</i> 	10
3	Process of Modeling <ul style="list-style-type: none"> <i>Additive and reductive processes</i> <i>Major Techniques of Sculpture: Modeling, Carving, Pointing</i> <i>Materials used in Modeling</i> <i>Clay Modeling and Carving</i> 	11
4	Contemporary Issues in Sculpture <ul style="list-style-type: none"> <i>Sculpture and Present Day Context</i> <i>Contemporary Sculptors and their Contribution</i> <i>Major Contemporary Issues in Sculpture</i> 	03
Total Hours		30

IV. Instruction Method and Pedagogy

Teaching will be practical based on the hands on experiences, live and interactive sessions. It will run in the workshop mode. Four Workshops (each of a day) will be organised during the semester.

V. Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45

Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

External Evaluation

University Practical examination will be for 70 marks and will test the performance, activities and creative presentations of the students with reference to the course selected:

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Viva / Practical	-	70	70
				Total 70

VI. Learning Outcomes

Upon successful completion of this course, students will be able to:

- Incorporate basic principles of aesthetics into sculpture
- Understand and apply basic concepts, styles and latest techniques of sculpting
- Explore traditional and experimental materials and design for sculpture
- Maintain a sketchbook of ideas and drawings to work out art project and to

document coursework and discussions.

- Understand the latest jargons, and develop collaborative skills to exhilarate the speed of accomplishing the piece of art
- Make their portfolio rich by accomplishing projects given during course
- Become familiar with varied key sculptural techniques and formal ideas through hands-on workshops and experimentation with a variety of materials and three-dimensional assignments
- Present their work with greater impact and confidence for future prospects
- Get benefitted into other subjects of their study by developing broader and all-inclusive approach to learning.

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS104: POTTERY AND CERAMIC ART

I. Credits and Schemes

Sem	Course Code	Course Name	Credits	Teaching Scheme	Evaluation Scheme				
					Theory		Practical		Total
				Contact Hours/Week	Internal	External	Internal	External	
II	HSUS104	Pottery and Ceramic Art	02	02	--	--	25	25	50

II. Course Objectives

- To encourage/ foster creativity among the students
- To introduce students to the craft of clay working
- To make the students able to create as well as appreciate expressive, beautiful three dimensional clay forms
- To recognize and realize the physical, emotional, and spiritual benefits of workingwith clay, and to except and come to terms with clays humbling qualities
- To build a higher-level understanding of the ceramic process, creating an awareness of the benefits of clay as a useful tool in their art therapy studies and practices
- To develop a deeper knowledge of the ceramic process, and become more confidentwith their hand building and glazing techniques
- To help them communicate an idea or emotion through their artwork

III. Course Outline

Module No.	Title/Topic	Classroom Contact Sessions
1	An Introduction to Clay <ul style="list-style-type: none"> • <i>Elements and Materials of Ceramic Art and Shape</i> • <i>Prehistoric Cultures</i> • <i>Basics of Pinching, Slabbing and Coiling</i> • <i>Potter's wheel, centring the clay, forming bowls and cylinders</i> 	5
	<ul style="list-style-type: none"> • <i>Trimming and burnishing on the wheel</i> • <i>Sketching the Pottery Models</i> 	
2	Types and Techniques of Making Pottery <ul style="list-style-type: none"> • <i>Types of Pottery:</i> <i>Porcelain Pottery, Earthenware Pottery, Stoneware Pottery</i> • <i>Techniques of Pottery:</i> <i>Hand-Built Pottery: Pinch, Coil, Slab Wheel-Thrown Pottery</i> 	7
3	Methods of Making Pottery <ul style="list-style-type: none"> • <i>Coil Method</i> • <i>Pinch Method</i> • <i>Slab Method</i> 	8
4	Decorating the Clays <ul style="list-style-type: none"> • <i>Different Methods of Decoration</i> • <i>Textures in Pottery</i> • <i>Colours, Painting, Carving, Glazing etc. in Pottery</i> 	7
5	Contemporary Issues in Pottery and Ceramic Art <ul style="list-style-type: none"> • <i>Present Day Pottery and Ceramic Art</i> • <i>Place of Pottery and Ceramic Art in Contemporary Art Society</i> • <i>Major Practitioners of Contemporary Pottery and Ceramic Art and their Contributions</i> 	3
Total Hours		30

IV. Instruction Method and Pedagogy

Teaching will be practical based on the hands on experiences, live and interactive sessions. It will run in the workshop mode. Four Workshops (each of a day) will be organised during the semester.

V. Evaluation

The students will be evaluated continuously in the form of their consistent performance

throughout the semester. There is no theoretical evaluation. There is just practical evaluation. The evaluation (practical) is schemed as 25 marks for internal evaluation and 25 marks for external evaluation.

VI. Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

VII. Learning Outcomes

At the end of the course, the learners will

- Have basic understanding of clay and glaze composition and formulation with emphasis on handbuilt ceramic forms.
- Have explored a variety of hanbuilding methods including extended pinch, slab builtand extruded forms
- have learned firing and glazing methods for stoneware clay
- have learned how finishing and decorating contribute or detract from the intentionas an artist
- Finally, a student will also have developed a sense of appreciation regarding how aunified, coherent form that is finely crafted is beautiful in its own right.

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS105: MEDIA AND GRAPHIC DESIGN

I. Credits and Schemes

Sem	Course Code	Course Name	Credits	Teaching Scheme	Evaluation Scheme				
					Theory		Practical		Total
				Contact Hours/Week	Internal	External	Internal	External	
II	HSUS105	Media and Graphic Design	02	02	--	--	25	25	50

II. Course Objectives

- To encourage/ foster creativity among the students
- To introduce students to the fundamentals of graphic designs
- To cultivate / spawn awareness among students about the significance of art and designs, art criticism and aesthetics
- To help the students understand the meanings of concept, designs, shapes, colors, print and medium
- To give the students first-hand experience of working on Graphic Software
- To develop in students an understanding of major issues, techniques and aspects of designs and print

III. Course Outline

Module No.	Title/Topic	Classroom Contact Sessions
1	An Introduction to Media and Graphic Design <ul style="list-style-type: none">• <i>Creating Art, Art in Context and Art as Inquiry</i>• <i>History of Graphic Design</i>• <i>Constructional, Representational, and Simplification Drawing</i>	03

2	Layout and Design <ul style="list-style-type: none"> • <i>Layout, Design and Aesthetics</i> • <i>Elements of Design</i> • <i>Principles of Design:</i> <i>Harmony, Balance, Rhythm, Perspective, Emphasis, Orientation, Repetition and Proportion</i> • <i>Impact/function of Design</i> 	07
	<ul style="list-style-type: none"> • <i>Indigenous design practices</i> • <i>Role of design in the changing social scenario</i> 	
3	Form and Space <ul style="list-style-type: none"> • <i>Types of Forms: Man-made, Nature</i> • <i>Types of Space: Negative and Positive</i> • <i>Composition of Form and Space to create Layout</i> • <i>Exploring Creativity</i> 	06
4	Computer Graphics <ul style="list-style-type: none"> • <i>An Introduction to Graphic Software</i> • <i>Flash, Coreldraw, Illustrator and Photoshop</i> • <i>Pre-press Process</i> 	04
5	Fonts <ul style="list-style-type: none"> • <i>Construction of Type</i> • <i>Anatomy of Type</i> • <i>Visual Language</i> • <i>Creating Logo and Symbol</i> 	04
6	Basic Print Media <ul style="list-style-type: none"> • <i>An Introduction to Press and its Development Phases</i> • <i>Types of Press</i> • <i>Types of Printing Technologies</i> • <i>Post-press Processes</i> 	03
7	Contemporary Issues in Graphic Design <ul style="list-style-type: none"> • <i>Present Day Graphic Designs</i> • <i>Contemporary Designers and their Contribution</i> • <i>Major Contemporary Issues in Graphic Design</i> 	03
Total Hours		30

IV. Instruction Method and Pedagogy

Teaching will be practical based on the hands on experiences, live and interactive sessions. It will run in the workshop mode. Four Workshops (each of a day) will be organised during the semester.

V. Evaluation

The students will be evaluated continuously in the form of their consistent performance throughout the semester. There is no theoretical evaluation. There is just practical evaluation. The evaluation (practical) is schemed as 25 marks for internal evaluation and 25 marks for external evaluation.

Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

VI. Learning Outcomes

At the end of the course, a student will

- have cultivated a sense of creativity.
- be appreciative of art and designs, art criticism and aesthetics.
- be able to recognize the elements of arts in graphic design.
- have better cognizance and association with the meaning of designs, shapes, colors, print and medium.
- be able to design graphics using computer softwares like Photoshop, CorelDraw, and Illustrator.

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS106: ART AND CRAFT

I. Credits and Schemes

Sem	Course Code	Course Name	Credits	Teaching Scheme	Evaluation Scheme				
					Theory		Practical		Total
				Contact Hours/Week	Internal	External	Internal	External	
II	HSUS106	Art and Craft	02	02	--	--	25	25	50

II. Course Objectives

- To encourage / foster creativity among the students
- To enable the students to work through the process of bringing an idea from conception to realization
- To enable students to create artifacts that are visually expressive
- To cultivate / spawn awareness among students about the significance of art, craft and aesthetics
- To develop students' graphic skills which may work towards the realization of ideas in the creation of 2D and 3D
- To provide opportunities to students to be conversant with the use of a variety of materials, media, tools and equipments for Art and Craft

III. Course Outline

Module No.	Title/Topic	Classroom Contact Sessions
1	An Introduction to Art and Craft <ul style="list-style-type: none">• <i>Basic Design and Forms</i>• <i>Space and Geometry</i>• <i>Elements of Nature and Object</i>	03
2	Paper Cutting <ul style="list-style-type: none">• <i>Study of Designs</i>• <i>Context of Space and Form</i>• <i>Types of Textures and Papers</i>• <i>Principles of Paper Cutting</i>	05

3	Design from Nature <ul style="list-style-type: none"> • <i>Nature as a Source of Design</i> • <i>Principles of Designing Natural Object</i> • <i>Decorative Forms</i> • <i>Cutting, Collaging, Embossing and Itching</i> 	08
4	Card Board Modeling <ul style="list-style-type: none"> • <i>Principles of Form and Space</i> • <i>Dimensions of Space and Shape</i> • <i>Process of Modeling and Decoration</i> 	06
5	Print Making <ul style="list-style-type: none"> • <i>An Introduction to Print Making</i> • <i>A Brief History of Print Making</i> • <i>Types of Print Making</i> • <i>Processing of Print Making</i> • <i>Sketching and Drawing</i> 	05
6	Contemporary Issues in Art and Craft <ul style="list-style-type: none"> • <i>Present-day Art and Craft</i> • <i>Using the Waste for making the Best</i> • <i>Contemporary Issues in Art and Craft</i> 	03
Total Hours		30

IV. Instruction Method and Pedagogy

Teaching will be practical - based on the hands on experiences, live and interactive sessions. It will run in the workshop mode. Four Workshops (each of a day) will be organised during the semester.

V. Evaluation

The students will be evaluated continuously in the form of their consistent performance throughout the semester. There is no theoretical evaluation. There is just practical evaluation. The evaluation (practical) is schemed as 25 marks for internal evaluation and 25 marks for external evaluation.

VI. Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

VI. Learning Outcomes

At the end of the course, students will be

- aware about the significance of art, craft and aesthetics.
- able to create artifacts that are visually expressive.
- able to lead the ideas from conceptualization with reference to the 2D and 3D model making.
- conversant with the use of a variety of materials, media, tools and equipments for creative Art and Craft.

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS109: DRAMATICS

I. Credits and Schemes

Sem.	Course Code	Course Name	Credits	Teaching Scheme	Evaluation Scheme				
					Theory		Practical		
				Contact Hours / Week	Internal	External	Internal	External	
	S109	matics		02	--	--	25	25	50

II. Course Objectives:

- To acquaint students with the concept of performing arts
- To teach professional acting skills to the students
- To offer training in the key areas of performance
- To acquaint students with the history, theory, and aesthetic value of theatre
- To provide students extensive training in acting skills (monologues, dialogues, and group scenes from a variety of sources), dance, voice, theatre production, and rehearsal techniques, which culminates in a performance before a live audience

III. Course Outline

Module	TITLE / TOPIC	Classroom Contact Sessions
1	Introduction to Drama <ul style="list-style-type: none"> • Introduction to performing arts • Drama - An art, a socializing activity, & a way of learning • Form of Drama • Elements of Drama • Types of Drama 	06
2	History of Drama and Contemporary Theatre <ul style="list-style-type: none"> • Important world dramatists & drama—from Greek to modern • Evolution of contemporary theatre in the context of developments in Indian theatre • Major Movements in Drama 	06

3	Theatre Design and Techniques <ul style="list-style-type: none"> • Theatre Architecture • Stage craft: Set, light, costume, make up, sound, props • Theatre techniques: from selection of script to final performance 	06
4	Technicalities of Stage Performance <ul style="list-style-type: none"> • Selection of plot and character • Improvisation • Movement • Voice, Speech, Imagination • Character Development • Scene Enactment 	08
5	Contemporary Trends in Drama <ul style="list-style-type: none"> • New Tendencies in theatre • Drama and Society • Using drama for Social Change and Education 	04

IV. Instruction Method and Pedagogy

Teaching will be practical based on the hands on experiences, live and interactive sessions. It will run in the workshop mode. Four Workshops (each of a day) will be organised during the semester.

V. Evaluation

The students will be evaluated continuously in the form of their consistent performance throughout the semester. There is no theoretical evaluation. There is just practical evaluation. The evaluation (practical) is schemed as 30 marks for internal evaluation and 70 marks for external evaluation.

Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

VI. Major Learning Outcomes

At the end of the course, a student will

1. be aware about the concept of performing art and its nuances.
2. display a working knowledge of historic of drama, its development and current trends in dramatics.
3. demonstrate skills in the technical/design preparation and execution of a theatre performance.
4. demonstrate the ability to work collaboratively.
5. develop essential transferable skills in various relevant areas of the theatre.

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS110: CONTEMPORARY DANCE

I. Credits and Schemes

Sem	Course Code	Course Name	Credits	Teaching Scheme Contact Hours/Week	Evaluation Scheme				
					Internal	Theory 1	Practical 1	Total	
II	HSUS110	temporary Dance	02	02	--	--	25	25	50

II. Course Objectives

- To introduce students to the concept of performing arts
- To develop in students the ability to express through the form of dance
- To foster creativity and innovativeness in students
- To enhance the aesthetic sensitivity among the students
- To inculcate in students contemporary dance techniques, philosophies, approaches, improvisation and performance disciplines
- To help students improve concentration, mental alertness, quick reflex action, physical agility and stress relief capacities
- To provide the students with complete awareness of one's own body
- To guide the students express themselves a natural way human feelings and expressions by creating harmony

III. Course Outline

Module No.	Title / Topic	Classroom Contact Sessions
1.	Introduction to dance Dance as a Performing Art Dance as a Medium of Expression History and Development of Dance	4
2.	Types of Dance Western dance and classical dance Salsa, rumba, hip hop, tap dance, belly dance, etc.	6

	Indian Classical Dance forms: Odissi, Bharatanatyama,Kathak, Kathakali, Kuchipudi etc. Other Regional dance forms in India	
3.	Basic Elements of Dance Movements of different parts of a body for Expression Concepts of: Nritya, Laya and Taal	4
4.	Technical Skills in Professional Contemporary Dance Dance technique: alignment, balance, co-ordination,flexibility and control <ul style="list-style-type: none"> • Expressive / presentation skills: Dynamic energy, physical engagement with the given material and stage, etc. • Skills and processes of rehearsal and production: physical energy, stamina and athleticism • Musicality: clarity of timing and phrasing 	6
5.	Contemporary Trends in Dance : <ul style="list-style-type: none"> • Prevalent trends and techniques in contemporary dance • Future trends in contemporary dance form • On Stage Performance 	10
Total Hours		30

IV. Instruction Method and Pedagogy

Teaching will be practical based on the hands on experiences, live and interactive sessions. It will run in the workshop mode. Four Workshops (each of a day) will be organised during the semester.

Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (caled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (caled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

V. Major Learning Outcomes

At the end of the course, a student will

- be able to develop ability to express through the form of dance.
- have enhanced aesthetic sensitivity.
- have improved concentration, mental alertness, quick reflex action, and physical agility.
- be able to express a natural way human feelings and expressions by creating harmony.
- be able to deliver contemporary dance performance.

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS111: Music (Vocal)

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	02	--	30	
Marks	--	50	--	50	02

Pre-requisite courses:

- No pre-requisites for this course

Objectives of the Course:

To facilitate the learners:

- To explore and understand Vocal Music
- with an opportunity to pursue the hobby of music on the campus
- to reduce stress and get energised to study better
- to explore and understanding about the Indian Music (Vocal), and its basic terms

Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1.	Introduction to Vocal Music	05
2.	Elements of Indian Vocal Music	08
3.	Introduction to Ragas and Taals	08
4.	A study of forms of Indian Vocal Music	05
5.	Contemporary Trends in Indian Vocal Music	04
	Total hours (Theory):	--
	Total hours (Practical):	30
	Total hours:	30

Detailed Syllabus:

1.	Introduction to Vocal Music	05 Hours	18 %
	Definition of Music; Concept of Vocal Music; Basic history and evolution of Indian music; Understanding the basic concepts of Indian music, including Swara, Raga, and Tala		
2.	Elements of Indian Vocal Music	07 Hours	26%

	Sound (Dhwani) and its origin; Andolan and its types; Naad and its quality; Vibration and Frequency; Sahayak Naad, 10 Thhats of Bhatkhande Ji, Saptak, Poorvang, Uttarang, Varna, Alankar, Vadi, Samvadi, Anuvadi, Vivadi, Gamak, Meend, knowledge of Taanpoora and its parts.		
3.	Introduction to Ragas and Taals	07 Hours	26%
	Learning basic ragas like Yaman and Bhupali; Understanding aroha (ascent) and avaroha (descent) of ragas; Introduction to the concept of tala (rhythm); Learning common talas like Teentaal and Ektaal; Basic tala exercises and rhythmic patterns.		
4.	A study of forms of Indian Vocal Music	05 Hours	16%
	Various forms of Indian Vocal Music: Carnatic Music, Thumari, Drupad etc; Study of Western Music and Style of Indian Music; Study of Regional Folk Music; Study of Gharana, Ravindra Sangeet and Carnatic Music		
5.	Contemporary Trends in Indian Vocal Music	04 Hours	14%
	Fusion Music; Indian Folk and Fusion; Sufi Revival; Cultural Fusion; Indian Vocal Music Festivals, Famous Indian Vocal Artists		

Course Outcome (COs):

At the end of the course, the students will be able to

CO1	Understand the concept and elements of Vocal Music
CO2	develop a clear and controlled singing voice with proper breath control and posture.
CO3	acquire the ability to sing basic scales, patterns, and simple compositions with accuracy and clarity.
CO4	understand and perform basic ragas and talas, including common rhythmic patterns.
CO5	appreciate and celebrate rich heritage of Indian Vocal Music

Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4)	45

(Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

Recommended study Material:

Reference Books:

1. "Ragas in Indian Music: A Complete Reference Source for Carnatic Ragas" by Dr. Rajan P. Parrikar - A comprehensive guide to Carnatic music ragas with historical context and audio samples.
2. "Ragas of Indian Music: Their Structure and Evolution" by Nazir Ali Jairazbhoy - An exploration of the structure and evolution of ragas in Hindustani music.
3. "The Raga Guide: A Survey of 74 Hindustani Ragas" by Joep Bor and others - A reference book with CDs that provides in-depth information on various Hindustani ragas, including their characteristics and performances.
4. "Indian Music and the West" by Gerry Farrell - A study of the impact of Indian music on Western music and culture.
5. "The Oxford Illustrated Companion to South Indian Classical Music" by Ludwig Pesch - A comprehensive resource on South Indian classical music, including Carnatic vocal music.

Web Sources:

1. https://onlinecourses.swayam2.ac.in/cec20_as04/preview
2. <https://www.sharda.org/>
3. https://onlinecourses.swayam2.ac.in/cec22_as02/preview
4. <https://www.udemy.com/course/learn-indian-voice-music-from-the-scratch-to-advance/>

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS112 : Music (Instrumental) - Tabla

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	02/15	--	30	02
Marks	--	25/25	--	50	

Pre-requisite courses:

- No pre-requisites for this course

Objectives of the Course:

To facilitate the learners:

- with an opportunity to pursue the hobby of dance on the campus
- to reduce stress and get energised to study better
- to explore and understanding about the instrument – Tabla, and its basic terms
- to play basic tals on Tabla and learn improvisation

Outline of the Course:

Sr	Title of the Unit	Minimum Number of Hours
1.	Introduction to Music (Tabla)	04
2.	Basic Terms	06
3.	Main Varnas of Playing Tabla	08
4.	Basic Taals	08
5.	Improvisation in Tritaal	04
	Total hours (Theory):	--
	Total hours (Practical):	30
	Total hours:	30

Detailed Syllabus:

1.	Introduction to Music (Tabla)	04 Hours	13.33%
	<ul style="list-style-type: none">• Explanation of the various parts of Tabla• Vilambit, Madhya and Dhrut Laya• Different Bols/Syllables played on Tabla• Introduction of the procedure of playing Tabla		

2.	Basic Terms	06 Hours	20%
	<ul style="list-style-type: none"> • Matra, Tal, Sam, Tali, Khali, Vibhag, Dugun, Avartan • Sangeet, Nad, Swar, Laya, Bol, Kisme, Kayda, Mukhda, Thai, Tigun, Chaugun, Tukda 		
3.	Main Varnas of Playing Tabla	08 Hours	26.66%
	<ul style="list-style-type: none"> • Dhet, Gadi, Gana Kraan, KaRaan, Ghraan, GhaRaan, DhumakiTa, DhirDhir, TeTedheTe 		
4.	Basic Taals	08 Hours	26.66%
	<ul style="list-style-type: none"> • Trital, • Jhaptal, • Dadra • Kaherva • Rupak/Tewra • Ektal/Adital 		
5.	Improvisation in Tritaal	04 Hours	13.33%
	<ul style="list-style-type: none"> • Tita and Tirkita kayda 		

Evaluation Scheme:

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS113: Music (Instrumental) - Guitar

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	02/15	--	30	02
Marks	--	50	--	50	

Pre-requisite:

- Correct posture for holding the guitar and plectrum

Objectives of the Course:

Students will be able to:

- Identify the different parts of a guitar song, such as the melody, harmony, and rhythm.
- Play a variety of strumming patterns and techniques.
- Understand the different types of scales and chords.
- Analyse arpeggios and riffs in different keys.
- Learn and perform contemporary guitar techniques and blues solos using a variety of scales and chords.
- Comprehend play guitar in a variety of styles, including acoustic, rock, blues, and country.

Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1.	Introduction to Structure, Tunes & Strumming	06
2.	Relation of Scales & Chords	06
3.	Arpeggios and Introduction to Riffs	07
4.	Contemporary Techniques and Blues Soloing	05
5.	Acoustic to Advance Style	06
	Total hours (Theory):	--
	Total hours (Practical):	30
	Total hours:	30

Detailed Syllabus:

1.	Introduction to Structure, Tunes & Strumming	06 hours	20%
	Basic chord progressions and strumming, Counting the beats along with strumming, Playing along with the metronome.		
	Introduction to the notes on the guitar and tuning procedures, Different strumming patterns and how you can create your own strumming patterns.		
2.	Relation of Scales & Chords	06 hours	20%
	Sequencing patterns (Minor & Major), 3 notes per string patterns, practicing scales using backing tracks, Formation of minor scales, Minor scale relation with major scale and visualization of the shapes. Harmonized major scale, Chord formation theory, Introduction to CAGED system., CAGED Barre chord shapes, Extended chord formation, Some basic shapes of extended chords.		
3.	Arpeggios and Introduction to Riffs	07 hours	22%
	Arpeggios shapes using CAGED system, Arpeggio exercises with sweep picking. Power chords, Power chord rhythm study using down strokes and accents, Palm Muting, Popular riffs.		
4.	Contemporary techniques and Blues Soloing	05 hours	18%
	Slides, Hammer-on, Pull-off, Vibrato, Legato exercises, introduction to Bending How 12 bar blues chord progressions are formed, Types of Blues chord progressions, Swing rhythm in 12 bar blues, Basic Blues riffs. Pentatonic scale shapes, Pentatonic scale sequencing Patterns, How to use pentatonic scale in blues soloing.		
5.	Acoustic to Advance Style	06 hours	20%
	Basic finger picking exercises, Etudes and popular song riffs, Fingerstyle rhythm. Detailed study of modes and improvisation using modes, Extended arpeggios and application, more extended chords (used in Jazz) Advanced blues soloing, Funk rhythm study, Advanced finger style grooves, Metal riffs and scale sequences.		

Course Outcome (COs):

At the end of the course, the students will be able to:

CO1	play a variety of tunes on the guitar, using different strumming patterns and techniques
CO2	understand and apply the relationship between scales and chords
CO3	play arpeggios and riffs on the guitar
CO4	learn and perform contemporary guitar techniques and blues solos
CO5	play guitar in a variety of styles, from acoustic to advanced
CO6	develop their own unique guitar sound and style

Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

Recommended Study Material:

❖ **Text book:**

1. Alternate Picking – Handbook by Clifford Martin
2. Guitar: For Beginners by Nicolas Crater

❖ **Web material:**

1. <https://www.youtube.com/watch?v=wAfbTvEeMmw&list=PLovStLXqoeZ1ncXap2csJ-FKgLuCyPQzY>
2. <https://www.youtube.com/watch?v=rTMN8rCBWkw>
3. <https://www.coursera.org/learn/guitar>
4. <https://www.coursera.org/learn/guitar-scales-chord-progressions>

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS114 : Music (Instrumental)- Harmonium

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	02/15	--	30	02
Marks	--	50	--	50	

Pre-requisite courses:

- No pre-requisites for this course

Objectives of the Course:

To facilitate the learners:

- with an opportunity to pursue the hobby of dance on the campus
- to reduce stress and get energised to study better
- to explore and understanding about the instrument – Harmonium, and its basic terms
- to play basic Raags on Harmonium

Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1.	Introduction to Harmonium	04
2.	Basic Terms	06
3.	Swar	08
4.	Raag	08
5.	Tal	04
	Total hours (Theory):	--
	Total hours (Practical):	30
	Total hours:	30

Detailed Syllabus:

1.	Introduction to Harmonium	04 Hours	13.33%
	<ul style="list-style-type: none"> • Understanding the parts of the harmonium • How to set up and maintain the harmonium • Basic hand positioning and posture 		
	<ul style="list-style-type: none"> • Introduction to the keyboard layout and finger numbering 		
2.	Basic Terms	06 Hours	20%
	<ul style="list-style-type: none"> • Swar, Raag, Tal, Alankar, Bandish, Saptak • Sthai, Aroh, Avroh, Aalap and Bolaan 		
3.	Swar	08 Hours	26.66%
	<ul style="list-style-type: none"> • Major Scale (Sa, Re, Ga, Ma, Pa, Dha, Ni, Sa) • Shuddha, Komal and Teevra Swars • Basic Compositions of Seven Surs 		
4.	Raag	08 Hours	26.66%
	<ul style="list-style-type: none"> • Kalyan • Bageshri • Bhairav • Bihag • Chhayananat • Puriya Dhanashri • Bhimpalas • Jaijaiwanti • Asawari • Bibhas • Miya Malhar • Multani • Darbari Kanada • Bilawal 		
5.	Tal	04 Hours	13.33%
	<ul style="list-style-type: none"> • Trital • Ektaal • Chautaal • Dadra • Kaherva • Rupak • Tewra • Surfakta (Sul taal) • Deepachandi • Tilwada 		

Course Outcome (COs):

At the end of the course, the students will be able to

CO1	Identify the parts of Harmonium and basic positioning before playing
CO2	Use the basic terms with understanding when it is needed in Harmonium playing
CO3	Identify and play the basic Swars of Tabla playing
CO4	Play the basics of the Raags mentioned
CO5	Identify and play along with the Tals mentioned

Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS115: Music (Instrumental) - Flute

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	02/15	--	30	02
Marks	--	50	--	50	

Objectives of the Course:

- To facilitate the learners:
- To introduce students to the fundamental techniques and principles of playing the flute.
 - To develop proficiency in basic flute playing skills, including tone production, finger technique, and breath control.
 - To explore different musical styles and genres through flute repertoire.
 - To foster an appreciation for the artistic and historical aspects of flute music.
 - To encourage individual and ensemble performance experiences.

Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1.	Introduction to the Flute	04
2.	Fundamentals of Sound Production	06
3.	Finger Technique and Scales	06
4.	Flute Repertoire	06
5.	Flute Styles and History	04
6.	Ensemble Playing	04
	Total hours (Theory):	--
	Total hours (Practical):	30
	Total hours:	30

Detailed Syllabus:

1.	Introduction to the Flute	04 Hours	14%
	<ul style="list-style-type: none">• Course orientation and objectives• Overview of the flute: parts and types• Assembly and disassembly of the flute		

	<ul style="list-style-type: none"> • Proper posture and hand positioning • Introduction to basic embouchure 		
2.	Fundamentals of Sound Production	06 Hours	20%
	<ul style="list-style-type: none"> • Breath control and support • Producing a clear and focused tone • Articulation techniques: tonguing and slurring • Dynamic control and expression • Tuning and intonation 		
3.	Finger Technique and Scales	06 Hours	20%
	<ul style="list-style-type: none"> • Basic fingerings and hand coordination exercises • Major and minor scales • Arpeggios and scale patterns • Chromatic scale • Articulation exercises 		
4.	Flute Repertoire	06 Hours	20%
	<ul style="list-style-type: none"> • Introduction to classical, folk, and popular flute repertoire • Selecting and preparing a solo piece • Interpretation and expression in music • Performance practice and stage presence 		
5.	Flute Styles and History	04 Hours	14%
	<ul style="list-style-type: none"> • Historical overview of flute music • Major flute composers and their contributions • Exploring different styles: classical, jazz, world music, etc. • Listening and analysis of representative pieces 		
6.	Ensemble Playing	04 Hours	12%
	<ul style="list-style-type: none"> • Introduction to flute ensembles • Collaborative rehearsal and performance • Role of the flute in chamber music • Developing ensemble communication skills 		

Course Outcome (COs):

At the end of the course, the students will be

CO1	Demonstrate proper flute posture, hand position, and embouchure technique.
CO2	Produce a clear and controlled flute tone.
CO3	Execute basic fingering patterns and scales fluently.
CO4	Interpret and perform a variety of musical pieces on the flute.
CO5	Identify key historical and stylistic characteristics of flute music.
CO6	Participate in ensemble performances and collaborate effectively with other musicians.

Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

Recommended Study Material:

❖ Reference books:

1. *The Flute Book: A Complete Guide for Students and Performers* by Nancy Toff
2. *Trevor Wye's Practice Books for the Flute* by Trevor Wye
3. *Flute Basics: A Method for Individual and Group Learning* by Sally Adams and Tracey Rush
4. *The Art of Flute Playing* by Edwin Putnik
5. *Selected Flute Solos: Everybody's Favorite Series, Volume 101*
6. *The Flute and Flute-Playing* by Theobald Boehm
7. *Flute Music by French Composers* edited by Louis Moyse

❖ Online Courses

1. Coursera - Introduction to Classical Music (Offered by Yale University)
2. Udemy - Flute Lessons for Beginners
3. Udemy - Intermediate Flute Lessons
4. edX - The Science of Flute Playing (Offered by MIT)
5. Skillshare - Flute: Start Playing Songs in 7 Lessons

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS116: Indian Classical Dance - Kathak

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	02	--	30	02
Marks	--	50	--	50	

Pre-requisite courses:

- No pre-requisites for this course.

Objectives of the Course:

To facilitate the learners:

- with an opportunity to pursue the hobby of dance on the campus
- to develop a flair for performing arts.
- to acquaint students with Indian classical dance form, and its basic terms
- make them aware with basic mudras, abhinayas, and steps of the dance form.

Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1.	Introduction to Kathak	06
2.	Footwork and Tatkar	06
3.	Abhinaya (Emotive Expressions)	06
4.	Toda and Tukda (Compositions)	06
5.	Ghungroo (Ankle Bells) and Rhythmic Patterns	06
	Total hours (Theory):	--
	Total hours (Practical):	30
	Total hours:	30

Detailed Syllabus:

1.	Introduction to Kathak	06 Hours	20%
	<ul style="list-style-type: none"> Understand the historical and cultural significance of Kathak. Learn the basic postures (Tal Poses) and their importance. Introduction to hand gestures (Mudras) and their meanings. Develop a basic understanding of rhythm (Tala) in Kathak. 		
2.	Footwork and Tatkari	06 Hours	20%
	<ul style="list-style-type: none"> Learn and practice basic footwork patterns (Tatkari). Develop proper foot placement and coordination. Understand the importance of rhythm and synchronization in Kathak. Explore the concept of Nritta (pure dance) in Kathak. 		
3.	Abhinaya (Emotive Expressions)	06 Hours	20%
	<ul style="list-style-type: none"> Understand the concept of Abhinaya in Kathak. Learn and practice facial expressions (Bhava) and emotions. Explore storytelling through dance. 		
4.	Toda and Tukda (Compositions)	06 Hours	20%
	<ul style="list-style-type: none"> Learn and perform basic Kathak compositions (Toda and Tukda). Understand the structure of Kathak compositions. Practice and refine the choreography. 		
5.	Ghungroo (Ankle Bells) and Rhythmic Patterns	06 Hours	20%
	<ul style="list-style-type: none"> Explore the significance of Ghungroo (ankle bells) in Kathak. Learn to wear and produce rhythmic sounds with Ghungroo. Practice and execute various rhythmic patterns (Bols). Understand the importance of laya (tempo) in Kathak. 		

Course Outcome (COs):

At the end of the course, the students will be able to

CO1	remember basic postures and hand gestures of Kathak.
CO2	understand the concept of Nritta in Kathak.
CO3	design storytelling through dance and will grasp the concept of Abhinaya and its role in Kathak.
CO4	perform basic Kathak Toda and Tukda compositions.
CO5	apply and create rhythmic sounds effectively with Ghungroo executing various rhythmic patterns through laya in Kathak.

Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

FACULTY OF PHARMACY

Bachelor of Pharmacy Program

Semester-II

HSUS117: Indian Classical Dance - Bharatanatyam

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	02	--	30	02
Marks	--	50	--	50	

Pre-requisite courses:

- No pre-requisites for this course.

Objectives of the Course:

To facilitate the learners:

- with an opportunity to pursue the hobby of dance on the campus
- to develop a flair for performing arts.
- to acquaint students with Indian classical dance form, and its basic terms
- make them aware basic mudras, abhinayas, and steps of the dance form.

Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1.	Introduction to Bharatanatyam	06
2.	Adavus and Footwork	06
3.	Abhinaya (Emotive Expressions)	06
4.	Rasa and Bhava	06
5.	Choreography and Performance	06
	Total hours (Theory):	--
	Total hours (Practical):	30
	Total hours:	30

Detailed Syllabus:

1.	Introduction to Bharatanatyam	06 Hours	20%
	<ul style="list-style-type: none"> Understand the historical and cultural significance of Bharatanatyam. Learn the basic postures (Asanas) and their importance. Introduction to hand gestures (Mudras) and their meanings. Develop a basic understanding of rhythm (Tala) in Bharatanatyam. 		
2.	Adavus and Footwork	06 Hours	20%
	<ul style="list-style-type: none"> Learn and practice basic Adavus (fundamental dance steps). Develop proper footwork and coordination. Understand the importance of rhythm in Bharatanatyam. Explore the concept of Nritta (pure dance) in Bharatanatyam. 		
3.	Abhinaya (Emotive Expressions)	06 Hours	20%
	<ul style="list-style-type: none"> Understand the concept of Abhinaya in Bharatanatyam. Learn and practice facial expressions (Bhava) and emotions. Explore storytelling through dance. 		
4.	Rasa and Bhava	06 Hours	20%
	<ul style="list-style-type: none"> Explore the nine Rasas (emotions) in Bharatanatyam. Learn how to evoke different emotions through expressions and movements. Understand the importance of emotional connectivity in dance. 		
5.	Choreography and Performance	06 Hours	20%
	<ul style="list-style-type: none"> Learn a simple Bharatanatyam composition. Understand the structure of a dance performance. Practice and refine the choreography. Gain confidence in performing in front of an audience. 		

Course Outcome (COs):

At the end of the course, the students will be able to

CO1	understand the historical and cultural significance of Bharatanatyam.
CO2	analyse proper footwork and coordination.
CO3	design storytelling through dance.
CO4	perform to evoke different emotions through expressions and movements.
CO5	remember the choreography and gain confidence in performing in front of an audience.

Evaluation Scheme

The evaluation scheme for the course will comprise the following components:

- Formative: Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks
- Summative: External / Semester End Evaluation (SEE) – 25 Marks

Internal / Continuous and Comprehensive Evaluation (CCE) – 25 Marks	
Exam Pattern	Marks
Lab Work Assessment (Best 3 out of 4)	45
Viva voce/ Lab Quiz (Best 3 out of 4) (Note: Quiz Number 1 and 3 will be administered as lab quizzes, while Quiz Number 2 and/or 4 shall serve as part of the mid-term evaluation.)	45
Attendance	10
Total	100* (scaled to 25 marks)

*Note: The total Internal / CCE score out of 100 marks will be converted to 25 marks.

External / Semester End Evaluation (SEE) – 25 Marks	
Exam Pattern	Marks
Quiz	40
Viva-voce	30
Presentation/Task/GD/Case Analysis etc. (The Course Convenor / Faculty will brief the students about the examination components and weightage)	30
Total	100* (scaled to 25 marks)

*Note: The total External / SEE score out of 100 marks will be converted to 25 marks.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

SYLLABI

(Semester – III)

CHAROTAR UNIVERSITY OF SCIENCE
AND TECHNOLOGY

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH3001: PHARMACEUTICAL ORGANIC CHEMISTRY-II (Theory)

Total hours: 45 Hr

Outline of the course

Sr. No.	Title of the unit	Minimum number of hours
1	Benzene and its derivatives	10
2	Phenols and aromatic amines	10
3	Fats and oils	10
4	Polynuclear hydrocarbons	8
5	Cyclo alkanes	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained.			
To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences.			
1.	Benzene and its derivatives Analytical, synthetic and other evidences in the derivation of structure of benzene, orbital picture, resonance in benzene, aromatic characters, Huckel's rule Reactions of benzene - nitration, sulphonation, halogenation-reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction Structure and uses of DDT, Saccharin, BHC and Chloramine	10 Hours	22.22%
2.	Phenols, Aromatic Amines and Aromatic Acids Phenols* - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols Aromatic Amines* - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts Aromatic Acids* -Acidity, effect of substituents on acidity and important reactions of benzoic acid.	10 Hours	22.22%
3.	Fats and Oils Fatty acids	10 Hours	22.22%

	Reactions: hydrolysis, hydrogenation, saponification and rancidity of oils, drying oils. Analytical constants: acid value, saponification value, ester value, iodine value, acetyl value, Reichert Meissl (RM) value –significance and principle involved in their determination fluid.		
4.	Polynuclear hydrocarbons Synthesis, reactions, structure and medicinal uses of naphthalene, phenanthrene, anthracene, diphenylmethane, triphenylmethane and their derivatives	8 Hours	17.77%
5.	Cyclo alkanes* Stabilities – Baeyer’s strain theory, limitation of Baeyer’s strain theory, Coulson and Moffitt’s modification, Sachse Mohr’s theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only	7 Hours	15.55%

Course Outcome (COs)

At the end of the course, the students would be able to

CO1	identify aromatic, non-aromatic and anti-aromatic compounds
CO2	write the reaction with their reactivity, stability and orientation for selected class of compounds
CO3	enumerate the preparations, reactions and uses of important organic compounds
CO4	describe various methods for evaluation of fats and oils with significance

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	2	-	-	-	-	-	-	-	2
CO2	2	-	2	-	-	-	-	-	-	-	-
CO3	2	-	2	-	-	-	-	-	-	-	2
CO4	3	-	3	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH3001P: PHARMACEUTICAL ORGANIC CHEMISTRY-II (Practical)

Total hours: 60 Hours

Outline of the course:

Sr. No.	Title of the Practical
1.	Experiments involving laboratory techniques <ul style="list-style-type: none">• Recrystallization• Steam distillation
2.	Determination of following oil values (including standardization of reagents) <ul style="list-style-type: none">• Acid Value• Saponification Value• Iodine Value
3.	Preparation of compounds: <ul style="list-style-type: none">• Benzanilide/phenyl benzoate/acetanilide from aniline/ phenol /aniline by acylation reaction• 2,4,6-Tribromo aniline/para bromo acetanilide from aniline/acetanilide by halogenation (bromination) reaction.• 5-Nitro salicylic acid/meta, di, nitro benzene from salicylic acid / nitro benzene by nitration reaction• Benzoic acid from benzyl chloride by oxidation reaction,• Benzoic acid/salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction• 1-Phenyl azo-2-naphthol from aniline by diazotization and coupling reactions• Benzil from benzoin by oxidation reaction.• Dibenzal acetone from benzaldehyde by claisen Schmidt reaction• Cinnamic acid from benzaldehyde by perkin reaction• p-iodo benzoic acid from p-amino benzoic acid.

Course Outcome (COs):

At the end of the course, the students would be able to:

CO1	apply various physicochemical techniques for synthesis of organic compounds
CO2	evaluate fixed oils using compendial methods
CO3	perform synthesis of various intermediates
CO4	rationalize the approach and interpret the results

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	3	3	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	1	-	2
CO3	2	3	3	-	-	-	-	-	-	-	-
CO4	-	-	2	-	-	-	-	3	-	-	-

Recommended Study Material:❖ **Textbook:**

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar, Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L. Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K. Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH3002: PHYSICAL PHARMACEUTICS-I (Theory)

Total hours: 45 Hr

Outline of the course

Sr. No.	Title of the unit	Minimum number of hours
1	Solubility of drugs	10
2	States of matter and properties of matter Physicochemical properties of drug molecules	10
3	Micromeritics	10
4	Complexation and protein binding	8
5	pH, buffers and Isotonic solutions	7

Detailed syllabus

Sr. No.	UNIT	Hours	Weightage (%)
1.	Solubility of drugs Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation and association, quantitative approach to the factors influencing solubility of drugs, dissolution and drug release, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (binary solutions, ideal solutions), Raoult's law, real solutions, azeotropic mixtures, fractional distillation. Partially miscible liquids, critical solution temperature and applications. Distribution law, its limitations and applications	10 Hours	22.22%
2.	States of Matter and properties of matter Physicochemical properties of drug molecules State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols – inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid-crystalline, amorphous and polymorphism. Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and Applications	10 Hours	22.22%

3.	Micromeretics Particle size and distribution, average particle size, number and weight distribution, particle number, methods for	10 Hours	22.22%
	determining particle size by (different methods), counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness and flow properties.		
4.	Complexation and protein binding Introduction, classification of complexation, applications, methods of analysis, protein binding, complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.	8 Hours	17.77%
5.	pH, buffers and Isotonic solutions Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe the fundamentals and applications of solubilization of drug
CO2	summarize and differentiate states of matter
CO3	describe the fundamentals of micromeritics and its applications in formulation development
CO4	describe effects of complexation and protein binding on drug action
CO5	describe the applications of buffers in pharmaceuticals

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	3	-	-	-	-	-	-	-	3
CO2	2	-	-	-	-	-	-	-	-	-	-
CO3	2	-	3	2	-	-	-	-	-	-	-
CO4	2	-	3	-	-	-	-	-	-	-	-
CO5	2	-	-	2	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH3002P: PHYSICAL PHARMACEUTICS-I (Practical)

Total hours: 60 Hours

Outline of the course

Sr. No.	Title of the Practical
1.	Determination the solubility of drug at room temperature
2.	Determination of pKa value by half neutralization/ Henderson Hassel Balch equation
3.	Determination of Partition co-efficient of benzoic acid in benzene and water
4.	Determination of partition co-efficient of iodine in CCl ₄ and water
5.	Determination of % composition of NaCl in a solution using phenol-water system by CST method
6.	Determination of particle size, particle size distribution using sieving method
7.	Determination of particle size, particle size distribution using microscopic method
8.	Determination of bulk density, true density and porosity
9.	Determine the angle of repose and influence of lubricant on angle of repose
10.	Determination of stability constant and donor acceptor ratio of PABA-caffeine complex by solubility method
11.	Determination of stability constant and donor acceptor ratio of cupric-glycine complex by pH titration method

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	determine and interpret the particle size distribution
CO2	determine solubility, critical solution temperature and partition co-efficient of drug
CO3	Determine pKa and stability constant of given sample through different methods
CO4	determine and interpret various derived properties of powder/ granules
CO5	interpret the results and draw the conclusion with rationale

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	3	3	-	-	-	-	-	-	-
CO2	2	-	3	-	-	-	-	-	-	-	3
CO3	2	-	3	-	-	-	-	-	-	-	3
CO4	2	-	3	-	-	-	-	-	-	-	3
CO5	3	-	3	-	-	-	-	3	-	-	-

Recommended Study Material:

❖ Textbook:

1. Physical pharmacy by Alfred Martin
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical pharmaceutics by Ramasamy C and Manavalan R.
8. Laboratory manual of physical pharmaceutics, C.V.S. Subramanyam, J. Thimma settee

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH3003: PHARMACEUTICAL MICROBIOLOGY (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction to microbiology	10
2	Techniques in microbiology	10
3	Sterilization techniques	10
4	Aseptic techniques	8
5	Pharmaceutical microbiology	7

Detailed Syllabus

Sr. No.	UNIT	Hours	Weightage (%)
1.	Introduction to Microbiology Introduction, history of microbiology, its branches, scope and its importance. Introduction to prokaryotes and eukaryotes Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total and viable count). Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy	10 Hours	22.22%
2.	Techniques in Microbiology Identification of bacteria using staining techniques (simple, Gram's and acid-fast staining) and biochemical tests (IMViC). Study of principle, procedure, merits, demerits and applications of Physical, chemical and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods Equipment employed in large scale sterilization. Sterility indicators.	10 Hours	22.22%

3.	Sterilization Techniques Study of morphology, classification, reproduction/replication and cultivation of fungi and virus. Classification and mode of action of disinfectants. Factors influencing disinfection, antiseptics and their evaluation for bacteriostatic and	10 Hours	22.22%
	bactericidal actions. Evaluation of bactericidals and bacteriostatics. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.		
4.	Aseptic Techniques Designing of aseptic area, laminar flow equipment; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic and testing of antimicrobial activity of a new substance. General aspects-environmental cleanliness.	8 Hours	17.77%
5.	Pharmaceutical Microbiology Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. Growth of animal cells in culture, general procedure for cell culture, primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	Differentiate microorganisms and describe the methods for identification, cultivation and preservation of microorganism
CO2	summarize the process of microbiological assay and sterility testing with rationale
CO3	describe methods for standardization of biological products with illustrations, role of disinfectants and their evaluation process
CO4	summarize the role of aseptic area in microbiology
CO5	describe the cell culture and methods to control contamination in microbiology

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	3	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-
C05	2	-	3	-	-	-	-	-	-	-	3

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH3003P: PHARMACEUTICAL MICROBIOLOGY (Practical)

Total hours: 60 Hours

Outline of the course

Sr. No.	Title of the Practical
1.	Introduction and study of different equipment and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology
2.	Sterilization of glassware, preparation and sterilization of media
3.	Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations
4.	Staining methods- simple, grams staining and acid-fast staining (demonstration with practical).
5.	Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques
6.	Microbiological assay of antibiotics by cup plate method and other methods
7.	Motility determination by hanging drop method.
8.	Sterility testing of pharmaceuticals
9.	Bacteriological analysis of water
10.	Biochemical test (IMViC reactions)
11.	Revision practical class

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	sterilize consumables to be used in microbial experiments
CO2	culture and sub-culture microorganisms
CO3	isolate and differentiate microorganisms
CO4	perform sterility testing and microbial assay of pharmaceutical products
CO5	describe applications of equipment used in microbiology laboratory
CO6	interpret the results and draw the conclusion with rationale

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	3
CO3	2	-	-	-	-	-	-	-	-	-	3
CO4	2	-	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-
CO6	2	-	3	-	-	-	-	3	-	-	-

Recommended Study Material:❖ **Textbook:**

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers and Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Prokhorov, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananthnarayan: Textbook of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K. Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH3004: PATHOPHYSIOLOGY (THEORY)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Basic principles of cell injury and adaptation and basic mechanism involved in the process of inflammation and repair	10
2	Cardiovascular system, respiratory system and renal system	10
3	Haematological diseases, endocrine disease, nervous system, gastrointestinal system	10
4	Disease of bones and joints, principles of cancer, diseases of bones and joints, principles of cancer	8
5	Infectious diseases and sexually transmitted diseases	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	<p>Basic Principles of Cell Injury and Adaptation and Basic Mechanism Involved in The Process of Inflammation and Repair</p> <p>Introduction, definitions, homeostasis, components and types of feedback systems, causes of cellular injury, pathogenesis (cell membrane damage, mitochondrial damage, ribosome damage, nuclear damage), morphology of cell injury – adaptive changes (atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia), cell swelling, intra cellular accumulation, calcification, enzyme leakage and cell death acidosis and alkalosis, electrolyte imbalance.</p> <p>Introduction, clinical signs of inflammation, different types of inflammation, mechanism of inflammation – alteration in vascular permeability and blood flow, migration of WBC's, mediators of inflammation, basic principles of wound healing in the skin, pathophysiology of atherosclerosis</p>	10 Hours	22.22%

2.	Cardiovascular System, Respiratory System and Renal system Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis.)	10 Hours	22.22%
3.	Asthma, Chronic obstructive airways diseases Acute and chronic renal failure Haematological Diseases, Endocrine Disease, Nervous System, Gastrointestinal system Iron deficiency, megaloblastic anemia (Vit B ₁₂ and folic acid), sickle cell anemia, thalassemia, hereditary acquired anemia, hemophilia. Diabetes, thyroid diseases, disorders of sex hormones. Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease. Peptic ulcer, inflammatory bowel diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease.	10 Hours	22.22%
4.	Disease of Bones and Joints, Principles of Cancer Rheumatoid arthritis, osteoporosis and gout. Classification, etiology and pathogenesis of cancer.	8 Hours	17.77%
5.	Infectious diseases and Sexually transmitted diseases Meningitis, typhoid, leprosy, tuberculosis urinary tract infections, AIDS, Syphilis, Gonorrhea	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	narrate the role of cell injury and inflammation in pathological conditions
CO2	describe risk factors, etiology and pathogenesis of infectious diseases
CO3	describe the pathophysiology of metabolic disorders
CO4	summarize the complications of various diseases

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	3	-	-	-	-	-	-	-	-
CO3	3	-	3	-	-	-	-	-	-	-	-
CO4	3	-	3	-	-	-	-	3	-	-	-

Recommended Study Material:

❖ Textbook:

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K.; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011.
5. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states;
6. William and Wilkins, Baltimore; 1991 [1990 printing].
7. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
8. Guyton A, John. E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010.
9. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey;
10. Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.
11. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.
12. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH3005: ENVIRONMENTAL SCIENCES (Theory)

Total hours: 45 Hr

Outline of the course

Sr. No.	Title of the unit	Minimum number of hours
1	The multidisciplinary nature of environmental studies	15
2	Concept of an ecosystem	15
3	Environmental Pollution	15

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	The Multidisciplinary Nature of Environmental Studies Natural Resources Renewable and non-renewable resources Natural resources and associated problems Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources	15 Hours	33.33%
2.	Concept of an Ecosystem Structure and function of an ecosystem Introduction, types, characteristic features, structure and function of the ecosystems: forest ecosystem; grassland ecosystem; desert ecosystem; aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	15 Hours	33.33%
3.	Environmental Pollution. Air pollution, water pollution, soil pollution	15 Hours	33.33%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe different types of resources and problems associated with them
CO2	narrate various types and impact of different environmental pollution
CO3	describe basic concept, structure and function of an ecosystem
CO4	suggest the probable solutions to sustainable utilization of natural resources

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	-	3	-
CO2	-	-	-	-	-	-	-	-	-	3	-
CO3	-	-	-	-	-	-	-	-	-	2	-
CO4	-	-	-	-	-	-	-	-	-	3	-

Recommended Study Material**❖ Textbook:**

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India,
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clanderson Press Oxford
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd. Down of Earth, Centre for Science and Environment

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

HS121.02 B: CREATIVITY, PROBLEM SOLVING AND INNOVATION

Credits and Hours

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	30/15	--	30/15	2
Marks	--	100	--	100	

Pre-requisite courses:

Creative Problem Solving <https://www.coursera.org/learn/creative-problem-solving>

Outline of the Course

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to creativity, problem solving and innovation	06
2.	Questioning, learning and visualization	06
3.	Creative thinking and problem solving	06
4.	Logic, language and reasoning	06
5.	Contemporary issues and practices in creativity and problem solving	

Total hours (Theory): --

Total hours (Practical): 30

Total hours (Lab): --

Total hours: 30

Detailed Syllabus:

Sr. No.	Perticulat	Hours	Weightage
1.	Introduction to Creativity, Problem Solving and Innovation	06 Hours	20%
	Definitions of creativity and innovation, need for problem solving and innovation, scope of creativity in various domains, types and styles of thinking, strategies to develop creativity, problem solving and innovation skills		
2.	Questioning, Learning and Visualization	6 Hours	20%
	Strategy and methods of questioning, asking the right questions, strategy of learning and its importance, sources and methods of learning, purpose and value of creativity education in real life, visualization strategies - making thoughts visible, mind mapping and visualizing thinking		
3.	Creative Thinking and Problem Solving	6 Hours	20%

	Creative thinking and its need, strategy of thinking fluency, generating all possibilities, scamper technique, divergent vs convergent thinking, lateral vs vertical thinking, fusion of ideas for problem solving, applying strategies for problem solving		
4.	Logic, Language and Reasoning	6 Hours	20%
	Basic concepts of logic, statement vs sentence, premises vs conclusion, concept of an argument, functions of language: informative, expressive and directive, inductive vs deductive reasoning, critical thinking and creativity, moral reasoning		
5.	Contemporary Issues and Practices in Creativity and Problem Solving	6 Hours	20%
	Cognitive research trust thinking for creatively solving problems, case study on contemporary issues and practices in creativity and problem solving		

Course Outcome (COs):

At the end of the course, the students will be able to

CO1	demonstrate creativity in their day-to-day activities and academic output
CO2	solve personal, social and professional problems with a positive and an objective mindset
CO3	think creatively and work towards problem solving in a strategic way
CO4	initiate new and innovative practices in their chosen field of profession
CO5	give logical ideas, opinions, and solutions to problems
CO6	think critically over the situation and drawing conclusion

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	3	-	-	-	-	3
CO5	-	-	3	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation, put “-”

Recommended Study Material:

- ❖ **Text book:**

1. R Keith Sawyer, ZigZag, The Surprising Path to Greater Creativity, Jossy-Bass Publication 2013
2. Michael Michalko, Crackling Creativity, The Secrets of Creative Genius, Ten Speed Press 2001

❖ **Reference book:**

1. Michael Michalko, Thinker Toys, Second Edition, Random House Publication 2006
2. Edward De Beno, De Beno's Thinking Course, Revised Edition, Pearson Publication 1994
3. Edward De Beno, Six Thinking Hats, Revised and Update Edition, Penguin Publication 1999
4. Tony Buzan, How to Mind Map, Thorsons Publication 2002
5. Scott Berkun, The Myths of Innovation, Expended and revised edition, Berkun Publication 2010
6. Tom Kelly and David Kelly, Creative confidence: Unleashing the creative Potential within Us all, William Collins Publication 2013
7. Ira Flatow, The all Laughed, Harper Publication 1992
8. Paul Sloane, Des MacHale& M.A. DiSpezio, The Ultimate Lateral & Critical Thinking Puzzle book, Sterling Publication 2002

❖ **Additional Readings**

1. Keith Sawyer, Group Genius, The Creative Power of Collaboration, Basic Books Publication 2007
2. Edward De Beno, Lateral Thinking, Creativity Step by Step, Penguin Publication 1973
3. Nancy Margulies with Nusa Mall, Mapping Inner Space, Crown House Publication 2002
4. Tom Kelly with Jonathan Littman, The Art of Innovation, Profile Publication 2001
5. Roger Von Oech, A Whack on the Side of the Head. Revised edition, Hachette Publication 1998
6. Roger Von Oech, A Kick in the Seat of the Head, William Morrow 1986
7. Jonah Lehrer,Imagine How Creativity Works,Canongate Books Publication 2012
8. James M Higgins, 101 Creative Problem Solving Techniques, New Management Publication1994
9. Soctt G Isaksen, K Brain Doval, Donald J Treffinger,Creative Approach to Problem Solving, Sage Publication 2000
10. Donald J Treffinger, scott G Isaksen, K Brain stead Dorval Creative Problem Solving An Introduction,Prufrog Press 2006
11. H Scott Fogler& Steven E. LeBlance,Strategies for Creative Problem Solving,Prentice Hall Publication 2008
12. Dave Gray, Sunni Brown and James Macanufo, Game Storming, O'reilly Publication 2010.
13. Howard Gardner, Creating minds,Basic Books Publication 1993

14. MihalyCsikzentmihalyi, Creativity–Flow and Psychology of Discovery and Invention,Harper Publication 1996
15. Martin Gerdner,W. H.,Ahal Insight,Freeman Publication 1978
16. Paul Sloane,Test Your Lateral Thinking IQ,Sterling Publication1994
17. Paul Sloane & Des Machale Intriguing, Lateral Thinking Puzzles,Sterling Publication 1996

❖ **Web material:**

Internet Search based May TED talks and other sources for videos, slide shares, problems, etc

FACULTY OF PHARMACY

Bachelor of Pharmacy Programme

SYLLABI

(Semester – IV)

**CHAROTAR UNIVERSITY OF SCIENCE
AND TECHNOLOGY**

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH4001: PHARMACEUTICAL ORGANIC CHEMISTRY-III (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Stereo isomerism	10
2	Geometrical isomerism	10
3	Heterocyclic compounds	10
4	Synthesis, reactions and medicinal uses of following compounds/derivatives	8
5	Reactions of synthetic importance	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
Note: To emphasize on definition, types, mechanisms, examples, uses/applications			
1.	Stereo Isomerism Optical isomerism – Optical activity, enantiomerism, diastereoisomerism, meso compounds, elements of symmetry, chiral and achiral molecules, DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers, reactions of chiral molecules, racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute	10 Hours	22.22%
2.	Geometrical Isomerism Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems). Methods of determination of configuration of geometrical isomers. Conformational isomerism in ethane, n-butane and cyclohexane. Stereo isomerism in biphenyl compounds (atropisomerism) and conditions for optical activity. Stereospecific and stereo selective reactions	10 Hours	22.22%
3.	Heterocyclic Compounds	10	22.22%

	Nomenclature and classification. Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene - Relative aromaticity, reactivity and Basicity of pyrrole	Hours	
4.	Synthesis, Reactions and Medicinal Uses of Following Compounds/Derivatives Pyrazole, imidazole, oxazole and thiazole. pyridine, quinoline, isoquinoline, acridine and indole. Basicity of pyridine. Synthesis and medicinal uses of pyrimidine, purine, azepines and their derivatives	8 Hours	17.77%
5.	Reactions of Synthetic Importance Metal hydride reduction (NaBH_4 and LiAlH_4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	summarize the stereo chemical aspects of organic compounds and stereo chemical reaction
CO2	describe the reaction with their reactivity, stability and orientation for heterocyclic compounds
CO3	write the nomenclature, properties and medicinal use of heterocyclic compounds
CO4	describe various name reactions of synthetic importance

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	2	-	-	-	-	-	-	-	3
CO2	2	-	2	-	-	-	-	-	-	-	2
CO3	2	-	2	-	-	-	-	-	-	-	2
CO4	2	-	2	-	-	-	-	-	-	-	3

Recommended Study Material:

❖ Textbook:

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A textbook of organic chemistry – Arun Bahl, B.S. Bahl.
3. Heterocyclic Chemistry by Raj K. Bansal.
4. Organic Chemistry by Morrison and Boyd.
5. Heterocyclic Chemistry by T.L. Gilchrist.

FACULTY OF PHARMACY

Bachelor of Pharmacy Programme BPH4002: BIOCHEMISTRY (Theory)

Total hours: 45 Hr

Outline of the course

Sr. No.	Title of the unit	Minimum number of hours
1	Carbohydrate metabolism and biological oxidation	10
2	Lipid metabolism and amino acid metabolism	10
3	Nucleic acid metabolism and genetic information transfer	10
4	Biomolecules and bioenergetics	8
5	Enzymes	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Carbohydrate Metabolism and Biological oxidation Carbohydrate metabolism <ul style="list-style-type: none"> • Glycolysis – Pathway, energetics and significance • Citric acid cycle- Pathway, energetics and significance • HMP shunt and its significance; glucose-6-Phosphate dehydrogenase (G6PD) deficiency • Glycogen metabolism Pathways and glycogen storage diseases (GSD), Gluconeogenesis- pathway and its significance • Hormonal regulation of blood glucose level and diabetes mellitus Biological oxidation <ul style="list-style-type: none"> • Electron transport chain (ETC) and its mechanism. • Oxidative phosphorylation and its mechanism and substrate level phosphorylation • Inhibitors ETC and oxidative phosphorylation/uncouplers 	10 Hours	22.22%
2.	Lipid Metabolism and Amino acid Metabolism Lipid metabolism <ul style="list-style-type: none"> • β-Oxidation of saturated fatty acid (palmitic acid) • Formation and utilization of ketone bodies; ketoacidosis <i>De novo</i> synthesis of fatty acids (palmitic acid) 	10 Hours	22.22%

	<ul style="list-style-type: none"> • Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D • Disorders of lipid metabolism: hypercholesterolemia, atherosclerosis, fatty liver and obesity <p>Amino acid metabolism</p> <ul style="list-style-type: none"> • General reactions of amino acid metabolism: Transamination, deamination and decarboxylation, urea cycle and its disorders • Catabolism of phenylalanine and tyrosine and their metabolic disorders (phenyketonuria, albinism, alkaptonuria, tyrosinemia) • Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline <p>Catabolism of heme; hyperbilirubinemia and jaundice</p>		
3.	<p>Nucleic Acid Metabolism and Genetic Information Transfer</p> <ul style="list-style-type: none"> • Biosynthesis of purine and pyrimidine nucleotides • Catabolism of purine nucleotides and hyperuricemia and gout disease organization of mammalian genome • Structure of DNA and RNA and their functions • DNA replication (semi conservative model) • Transcription or RNA synthesis • Genetic code, translation or protein synthesis and inhibitors 	10 Hours	22.22%
4.	<p>Biomolecules and Bioenergetics</p> <p>Biomolecules</p> <ul style="list-style-type: none"> • Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins. <p>Bioenergetics</p> <ul style="list-style-type: none"> • Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential. • Energy rich compounds; classification; biological significances of ATP and cyclic AMP 	8 Hours	17.77%
5.	<p>Enzymes</p> <ul style="list-style-type: none"> • Introduction, properties, nomenclature and IUB classification of enzymes, enzyme kinetics (Michaelis plot, Line Weaver Burke plot) • Enzyme inhibitors with examples 	7 Hours	15.55%

	<ul style="list-style-type: none"> • Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation • Therapeutic and diagnostic applications of enzymes and isoenzymes. Coenzymes –Structure and biochemical functions 		
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Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe biochemical aspects of cell metabolism, importance of enzyme and enzymatic reactions
CO2	summarize metabolic pathway of important biomolecules
CO3	summarize role of DNA and RNA in protein synthesis
CO4	describe enzymatic reaction and its application in drug metabolism

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	3
CO3	2	-	-	-	-	-	-	-	-	-	2
CO4	3	-	-	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY

Bachelor of Pharmacy Programme BPH4002P: BIOCHEMISTRY (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	Title of the Practical
1	Qualitative analysis of carbohydrates (glucose, fructose, lactose, maltose, sucrose and starch)
2	Identification tests for proteins (albumin and casein)
3	Quantitative analysis of reducing sugars (DNSA method) and proteins (Biuret method)
4	Qualitative analysis of urine for abnormal constituents
5	Determination of blood creatinine
6	Determination of blood sugar
7	Determination of serum total cholesterol
8	Preparation of buffer solution and measurement of pH
9	Study of enzymatic hydrolysis of starch
10	Determination of Salivary amylase activity
11	Study the effect of Temperature on Salivary amylase activity
12	Study the effect of substrate concentration on salivary amylase activity

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	identify and discriminate the given sample of carbohydrate and protein
CO2	determine carbohydrates, creatinine, proteins and cholesterols in given samples
CO3	study the effect of external variables on enzyme activity
CO4	prepare buffer solutions of given specifications
CO5	justify the results based on experimental data and comment

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	2	-	-	-	-	-	-	-	-
CO2	2	-	2	-	-	-	-	-	-	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-
CO4	2	-	3	-	-	-	-	-	-	-	2
CO5	-	-	2	-	-	-	-	3	-	-	-

Recommended Study Material:

❖ Textbook:

1. Principles of Biochemistry by Lehninger.
2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U. Chakrapani
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf
8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH4003: PHYSICAL PHARMACEUTICS-II (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Drug stability	10
2	Rheology and deformation of solids	10
3	Coarse dispersion	10
4	Surface and interfacial phenomenon	8
5	Colloidal dispersions	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Drug stability Reaction kinetics: zero, pseudo-zero, first and second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific and general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis and oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention.	10 Hours	22.22%
2.	Rheology and Deformation of Solids Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatants, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling sphere, rotational viscometer. Plastic and elastic deformation, Heckel equation, stress, strain, elastic modulus	10 Hours	22.22%
3.	Coarse Dispersion Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; physical stability of emulsions,	10 Hours	22.22%

	preservation of emulsions, rheological properties of emulsions, phase equilibria and emulsion formulation.		
4.	Surface and Interfacial Phenomenon Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB scale, solubilisation, detergency, adsorption at solid interface	8 Hours	17.77%
5.	Colloidal Dispersions Classification of dispersed systems and their general characteristics, size and shapes of colloidal particles, classification of colloids and comparative account of their general properties. Optical, kinetic and electrical properties. Effect of electrolytes, coacervation, peptization and protective action.	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to;

CO1	describe reaction kinetics for pharmaceuticals
CO2	describe the rheological properties of pharmaceutical substances
CO3	describe properties, rheological consideration and stability of coarse dispersions
CO4	distinguish surface and interfacial phenomenon of colloidal dispersions

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	3	-	-	-	-	-	-	-	-
CO2	2	-	3	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH4003P: PHYSICAL PHARMACEUTICS-I (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	Title of the Practical
1	Determination of surface tension of given liquids by drop count and drop weight method
2	Determination of HLB number of a surfactant by saponification method
3	Determination of Freundlich and Langmuir constants using activated char coal
4	Determination of critical micellar concentration of surfactants
5	Determination of viscosity of liquid using Ostwald's viscometer
6	Determination sedimentation volume with effect of different suspending agent
7	Determination sedimentation volume with effect of different concentration of single suspending agents
8	Determination of viscosity of semisolid by using Brookfield viscometer
9	Determination of reaction rate constant first order.
10	Determination of reaction rate constant second order
11	Accelerated stability studies

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	determine rheological properties of given liquids and semisolids
CO2	determine spreading co-efficient and critical micelle concentration of given sample of liquids
CO3	evaluate the physical stability parameters of coarse dispersion
CO4	determine reaction kinetics using different methods
CO5	justify the results based on experimental data and comment

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	3	2	-	-	-	-	-	-	-
CO2	2	-	3	-	-	-	-	-	-	-	-
CO3	2	-	3	-	-	-	-	-	-	-	3
CO4	2	-	3	-	-	-	-	-	-	-	-
CO5	2	-	3	-	-	-	-	2	-	-	-

Recommended Study Material:

❖ Textbook:

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH4004: PHARMACOLOGY-I (THEORY)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	General pharmacology	10
2	General pharmacology	10
3	Pharmacology of peripheral nervous system	10
4	Pharmacology of central nervous system	8
5	Pharmacology of central nervous system	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	General Pharmacology Introduction to pharmacology: Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, agonists, antagonists (competitive and non-competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy. Pharmacokinetics: Membrane transport, absorption, distribution, metabolism and excretion of drugs. Enzyme induction, enzyme inhibition, kinetics of elimination	10 Hours	22.22%
2.	General Pharmacology	10	22.22%

	Pharmacodynamics: Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein-coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action. Adverse drug reactions. Drug interactions (pharmacokinetic and pharmacodynamic). Drug discovery and clinical evaluation of new drugs: Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.	Hours	
3.	Pharmacology of Peripheral Nervous System Organization and function of ANS. Neurohumoral transmission, co-transmission and classification of neurotransmitters. Parasympathomimetics, parasympatholytics, sympathomimetics, sympatholytics. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral). Local anesthetic agents. Drugs used in myasthenia gravis and glaucoma	10 Hours	22.22%
4.	Pharmacology of Central Nervous System Neurohumoral transmission in the CNS, special emphasis on importance of various neurotransmitters like with GABA, glutamate, glycine, serotonin, dopamine, general anesthetics and pre-anesthetics. Sedatives, hypnotics and centrally acting muscle relaxants. Anti-epileptics, alcohols and disulfiram	8 Hours	17.77%
5.	Pharmacology of Central Nervous System Psychopharmacological agents: antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens. Drugs used in Parkinsons disease and Alzheimer's disease. CNS stimulants and nootropics. Opioid analgesics and antagonists. Drug addiction, drug abuse, tolerance and dependence.	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to;

CO1	summarize basics of pharmacokinetics and pharmacodynamics
CO2	depict mechanism of action of drugs affecting nervous system with the description
CO3	classify drugs affecting nervous system
CO4	describe the side effects and specific therapeutic uses of drugs acting on nervous system

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	3	-	-	-	-	-	-	3
CO2	3	-	3	-	-	-	-	-	-	-	-
CO3	3	-	3	-	-	-	-	-	-	-	-
CO4	3	-	3	-	-	-	-	-	-	-	3

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH4004P PHARMACOLOGY-I (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	Title of the Practical
1	Introduction to experimental pharmacology
2	Commonly used instruments in experimental pharmacology
3	Study of common laboratory animals
4	Maintenance of laboratory animals as per CPCSEA guidelines
5	Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies
6	Study of different routes of drugs administration in mice/rats
7	Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice
8	Effect of drugs on ciliary motility of frog oesophagus
9	Effect of drugs on rabbit eye
10	Effects of skeletal muscle relaxants using rota-rod apparatus
11	Effect of drugs on locomotor activity using actophotometer
12	Anticonvulsant effect of drugs by MES and PTZ method
13	Study of stereotype and anti-catatonic activity of drugs on rats/mice
14	Study of anxiolytic activity of drugs using rats/mice
15	Study of local anesthetics by different methods

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	comprehend the functional roles of CPCSEA in animal experiments
CO2	perform basic laboratory techniques for administration of drugs and withdrawal of biological fluid samples
CO3	evaluate effect of drugs acting on sensory organs
CO4	evaluate the effect of drugs on nervous system
CO5	interpret the results and propose the conclusion with explanation

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	3	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	3
CO3	3	-	3	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-
CO5	3	-	3	-	-	-	-	3	-	-	-

Recommended Study Material:

❖ Textbook:

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews Pharmacology
6. K. D. Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R. Craig and Robert,
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton and Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH4005: PHARMACOGNOSY-I (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction to pharmacognosy, classification of drugs, quality control of drugs of natural origin	10
2	Cultivation, collection, processing and storage of drugs of natural origin and conservation of medicinal plants	10
3	Plant tissue culture	7
4	Pharmacognosy in various systems of medicine and introduction to secondary metabolites	10
5	Study of biological source, chemical nature and uses of drugs of natural origin containing drugs	8

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Introduction to Pharmacognosy, Classification of drugs, Quality Control of Drugs of Natural Origin Definition, history, scope and development of pharmacognosy. Sources of Drugs – Plants, Animals, Marine and Tissue culture. Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins). Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs. Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.	10 Hours	22.22%
2.	Cultivation, Collection, Processing and Storage of Drugs of Natural Origin and Conservation of Medicinal Plants Cultivation and collection of drugs of natural origin. Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants	10 Hours	22.22%
3.	Plant Tissue Culture		15.55%

	Historical development of plant tissue culture, types of cultures, nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines	7 Hours	
4.	Pharmacognosy in Various Systems of Medicine and Introduction to Secondary Metabolites	10 Hours	22.22%
	Role of pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine. Definition, classification, properties and test for identification of alkaloids, glycosides, flavonoids, tannins, volatile oil and resins		
5.	Study of Biological Source, Chemical Nature and Uses of Drugs of Natural Origin Containing Drugs Plant products: Fibers - Cotton, Jute, Hemp. Hallucinogens, Teratogens, Natural allergens Primary metabolites: General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as pharmaceutical aids and/or medicines for the following primary metabolites: Carbohydrates: acacia, agar, tragacanth, honey Proteins and enzymes: gelatin, casein, proteolytic enzymes (papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin). Lipids (waxes, fats, fixed oils): castor oil, chaulmoogra oil, wool fat, bees wax Marine Drugs: Novel medicinal agents from marine sources	8 Hours	17.77%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	summarize the history, scope and development of pharmacognosy
CO2	describe factors affecting cultivation, collection, processing and storage of drugs
CO3	apply knowledge of plant tissue culture in the field of pharmacognosy
CO4	classify different types of phytoconstituents and describe their importance
CO5	summarize and justify role of pharmacognosy in allopathy as well as traditional systems of medicine
CO6	describe and suggest the methods for assessing the quality of crude drugs

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	-	-	-	-	-	-	-	-
CO2	2	-	1	-	-	-	-	-	-	-	2
CO3	2	-	2	-	-	-	-	-	-	3	-
CO4	2	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	2
CO6	3	-	2	-	-	-	-	-	-	-	2

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH4005P: PHARMACOGNOSY-I (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	Title of the Practical
1	Analysis of crude drugs by chemical tests: (i) tragacanth (ii) acacia (iii) agar (iv) gelatin (v) starch (vi) honey (vii) castor oil
2	Determination of stomatal number and index
3	Determination of vein islet number, vein islet termination and paliside ratio
4	Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5	Determination of Fiber length and width
6	Determination of number of starch grains by lycopodium spore method
7	Determination of ash value
8	Determination of extractive values of crude drugs
9	Determination of moisture content of crude drugs
10	Determination of swelling index and foaming

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	identify the presence of different types of phytoconstituents in crude drugs by chemical tests
CO2	perform quantitative microscopic evaluation
CO3	perform proximate analysis of herbal drugs and interpret the results
CO4	assess the data and interpret the results

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	2	-	-	-	-	-	-	-	-
CO2	2	-	3	3	-	-	-	-	-	-	-
CO3	2	-	3	3	-	-	-	-	-	-	-
CO4	-	-	2	-	-	-	-	3	-	-	-

Recommended Study Material:

❖ Textbook:

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Textbook of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Textbook of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IIInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

HS111.02 B: HUMAN VALUES & PROFESSIONAL ETHICS

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	02/01	--	30/15	2
Marks	--	100	--	100	

Pre-requisite courses:

- Ethical Leadership through Giving Voice to Values
<https://www.coursera.org/learn/uva-darden-giving-voice-to-values?skipBrowseRedirect=true>

Objectives of the Course:

To facilitate learners to:

- Develop a familiarity with the fundamental human values and professional ethics
- Understand basic concepts of values and ethics
- Explore and understand values, ethics in context of professional, social and personal spectrum
- Explore and understand values, ethics in context of globalization and global issues
- Explore an application of values and ethics in personal, social, academic, global and profession life.
- Facilitate the learners to understand harmony at all the levels of human living, and live accordingly.

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Values and Ethics	05
2.	Elements and Principles of Values	08
3.	Applied Ethics	08
4.	Value, Ethics & Global Issues	05
5.	Contemporary Issues in Values and Ethics	04

Total hours (Theory): --

Total hours (Practical): 30

Total hours (Lab) : --

Total hours : **30**

Detailed Syllabus:

Sr. No.	Unit	Hours	Weightage
1.	Introduction to Values and Ethics		17%

	Need, relevance and significance of values general, concept and meaning of values and ethics	5 Hours	
2.	Elements and Principles of Values	8 Hours	26%
	Universal qnd personal values, social, civic and democratic value		
3.	Applied Ethics	8 Hours	26%
	Universal code of ethics, professional ethics, organizational ethics, ethical leadership, domain specific ethics		
4.	Value, Ethics and Global Issues	5 Hours	17%
	Cross-cultural issues, role of ethics and values in sustainability		
5.	Contemporary Issues in Values and Ethics	4 Hours	14%
	Case studies, presentations, projects		

Course Outcome (COs):

At the end of the course, the students will be able to:

CO1	understand the concepts and mechanics of values and ethics
CO2	understand the significance of value and ethical inputs in and get motivated to apply them in their life and profession
CO3	understand the significance of value and ethical inputs in and get motivated to apply them in social, global and civic issues.
CO4	develop their responsibility towards society
CO5	comprehend their own core values and adhere to those values at their workplace
CO6	practice pthical leadership

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	-	-	-	2	-	-	-	-
CO3	-	-	-	-	-	-	2	-	-	-	-
CO4	-	-	-	-	-	2	2	-	3	3	-
CO5	-	-	-	-	-	-	2	-	-	-	3
CO6	-	-	-	-	3	-	2	-	-	-	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation, put “-”

Recommended Study Material:

❖ Reference book:

1. Human Values and Ethics in Workplace, United Nations Settlement Program, 2006.
2. Ethics for Everyone, Arthur Dorbin, 2009.
3. Values and Ethics for 21st Century, BBVA.

❖ Web material:

- www.ethics.org

FACULTY OF PHARMACY

Bachelor of Pharmacy Programme

SYLLABI

(Semester – V)

**CHAROTAR UNIVERSITY OF SCIENCE
AND TECHNOLOGY**

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH5001: MEDICINAL CHEMISTRY-I (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction to Medicinal Chemistry	10
2	Drugs acting on Autonomic Nervous System	10
3	Cholinergic Neurotransmitters	10
4	Drugs acting on Central Nervous System	8
5	Drugs acting on Central Nervous System	7

Detailed Syllabus:

Course Content: Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

Sr. No.	UNIT	Hours	Weightage (%)
1.	Introduction to Medicinal Chemistry, History and Development of Medicinal Chemistry, Physicochemical Properties in Relation to Biological Action, Drug Metabolism Introduction to Medicinal Chemistry, history and development of medicinal chemistry, physicochemical properties in relation to biological action, ionization, Solubility, partition coefficient, hydrogen bonding, protein binding, chelation, bioisosterism, optical and geometrical isomerism. Drug metabolism principles- Phase I and Phase II. Factors affecting drug metabolism including stereo chemical aspects.	10 Hours	22.22%
2.	Drugs acting on Autonomic Nervous System: Adrenergic Neurotransmitters: Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha and Beta) and their distribution.	10 Hours	22.22%

	<p>Sympathomimetic agents: SAR of sympathomimetic agents, Direct acting: nor-epinephrine, epinephrine, phenylephrine*, dopamine, methyldopa, clonidine, dobutamine, isoproterenol, terbutaline, salbutamol*, bitolterol, naphazoline, oxymetazoline and xylometazoline. Indirect acting agents: hydroxyamphetamine, pseudoephedrine, propylhexedrine. Agents with mixed mechanism: ephedrine, metaraminol.</p> <p>Adrenergic Antagonists:</p> <p>Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.</p> <p>Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.</p>		
3.	<p>Cholinergic neurotransmitters, Parasympathomimetic agents</p> <p>Cholinergic neurotransmitters: Biosynthesis and catabolism of acetylcholine. Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.</p> <p>Parasympathomimetic agents: SAR of Parasympathomimetic agents, Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine.</p> <p>Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium Chloride, Tacrine Hydrochloride, Ambenonium Chloride, Isofluorophate, Echothiophate Iodide, Parathione, Malathion.</p> <p>Cholinesterase reactivator: pralidoxime chloride.</p> <p>Cholinergic Blocking agents: SAR of cholinolytic agents.</p> <p>Solanaceous alkaloids and analogues: Atropine Sulphate, Hyoscyamine Sulphate, Scopolamine Hydrobromide, Homatropine Hydrobromide, Ipratropium Bromide*.</p> <p>Synthetic Cholinergic Blocking Agents: Tropicamide, Cyclopentolate Hydrochloride, Clidinium Bromide, Dicyclomine Hydrochloride*, Glycopyrrolate, Methantheline Bromide, Propantheline Bromide, Benztropine Mesylate, Orphenadrine Citrate, Biperidine Hydrochloride, Procyclidine Hydrochloride*, Tridihexethyl Chloride, Isopropamide Iodide, Ethopropazine Hydrochloride.</p>	10 Hours	22.22%

4.	Drugs acting on Central Nervous System	17.77%
	<p>A. Sedatives and Hypnotics</p> <p>Benzodiazepines: SAR of benzodiazepines, chlordiazepoxide, diazepam*, oxazepam, chlorazepate, lorazepam, alprazolam, zolpidem.</p> <p>Barbiturates: SAR of barbiturates, barbital*, phenobarbital, mephobarbital, amobarbital, butabarbital, pentobarbital, secobarbital.</p> <p>Miscellaneous: Amides and imides: Glutethimide. Alcohol and their carbamate derivatives: Meprobamate, Ethchlorvynol. Aldehyde and their derivatives: triclofos sodium, paraldehyde.</p> <p>B. Antipsychotics</p> <p>Phenothiazine: SAR of Phenothiazine, promazine hydrochloride, chlorpromazine hydrochloride*, trifluopromazine, thioridazine hydrochloride piperacetazine hydrochloride, prochlorperazine maleate, trifluoperazine hydrochloride.</p> <p>Ring analogues of phenothiazine: chlorprothixene, thiothixene, loxapine succinate, clozapine.</p> <p>Fluro buterophenones: haloperidol, droperidol, risperidone.</p> <p>Beta amino ketones: molindone hydrochloride.</p> <p>Benzamides: sulpiride.</p> <p>C. Anticonvulsants</p> <p>SAR of Anticonvulsants, mechanism of anticonvulsant action. Barbiturates: phenobarbitone, methobarbital. Hydantoins: phenytoin*, mephenytoin, ethotoin. Oxazolidine diones: trimethadione, paramethadione. Succinimides: phensuximide, methsuximide, ethosuximide*. Urea and monoacylureas: phenacemide, carbamazepine*. Benzodiazepines: clonazepam. Miscellaneous: primidone, valproic acid, gabapentin, felbamate</p>	8 Hours

5. Drugs acting on Central Nervous System		15.55%
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<p>General anesthetics</p> <p>Inhalation anesthetics: halothane*, methoxyflurane, enflurane, sevoflurane, isoflurane, desflurane.</p> <p>Ultra short acting barbiturates: methohexital sodium*, thiamylal sodium, thiopental sodium. Dissociative anesthetics: ketamine hydrochloride.*</p> <p>Narcotic and non-narcotic analgesics</p> <p>Morphine and related drugs: SAR of morphine analogues, morphine sulphate, codeine, meperidine hydrochloride, anileridine hydrochloride, diphenoxylate hydrochloride, loperamide hydrochloride, fentanyl citrate*, methadone hydrochloride*, propoxyphene hydrochloride, pentazocine, levorphanol tartarate.</p> <p>Narcotic antagonists: nalorphine hydrochloride, levallorphan tartarate, naloxone hydrochloride.</p> <p>Anti-inflammatory agents</p> <p>Sodium salicylate, aspirin, mefenamic acid*, meclofenamate, indomethacin, sulindac, tolmetin, zomepriac, diclofenac, ketorolac, ibuprofen*, naproxen, piroxicam, phenacetin, acetaminophen, antipyrine, phenylbutazone.</p>	7 Hours	
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Course Outcome (COs):

At the end of the course, the students would be able to

CO1	corelate physicochemical properties of drug to biological action
CO2	describe the chemistry and structure activity relationship of drugs with respect to their pharmacological activity
CO3	narrate the drug metabolic pathways through illustrations, and impact on drug action
CO4	suggest, categorise and write the chemical synthetic pathways of selected drugs

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	2	-	-	-	-	-	-	-	-
CO2	2	-	2	-	-	-	-	-	-	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH5001P: MEDICINAL CHEMISTRY-I (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	Title of the Practical
1	Preparation of drugs and intermediates: <ul style="list-style-type: none">• 1,3-pyrazole• 1,3-oxazole• Benzimidazole• Benztriazole• 2,3- diphenyl quinoxaline• Benzocaine• Phenytoin• Phenothiazine• Barbiturate
2	Assay of drugs: <ul style="list-style-type: none">• Chlorpromazine• Phenobarbitone• Atropine• Ibuprofen• Aspirin• Furosemide
3	Determination of Partition coefficient for drugs

Course Outcome (COs):

At the end of the course, the students would be able to;

CO1	synthesize the intermediates and drugs (APIs)
CO2	perform assay of drugs using appropriate analytical methods
CO3	determine partition coefficient of medicinal compounds
CO4	apply software tools to draw structures, reactions and mechanism
CO5	carry out necessary calculations, prepare the report and justify the approach

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11
CO1	2	3	3	-	-	-	-	3	-	-	-
CO2	3	3	3	3	-	-	-	3	-	-	-
CO3	2	3	3	-	-	-	-	3	-	-	-
CO4	2	3	3	3	-	-	-	3	-	-	-
CO5	-	-	2	-	-	-	-	3	-	-	-

Recommended Study Material:**❖ Textbook:**

1. Wilson and Griswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol. I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Graham L. Petrick's An introduction to Medicinal Chemistry
8. D. Sriram and P. Yogeshwari's Medicinal Chemistry
9. Camile G. Wermuth's The Practice of Medicinal Chemistry
10. Kadam, Mahadik and Bothra's Principle of Medicinal Chemistry (Vol I and II)

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH5002: INDUSTRIAL PHARMACY-I (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the Unit	Minimum number of hours
1	Preformulation Studies	7
	Physical properties	
	Chemical Properties	
2	Tablets	10
	Liquid orals	
3	Capsules	8
	Pellets	
4	Parenteral Products	10
	Ophthalmic Preparations	
5	Cosmetics	10
	Pharmaceutical Aerosols	
	Packaging Materials Science	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Preformulation Studies, Physical properties, Chemical Properties Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances. Physical form (crystal and amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism. Hydrolysis, oxidation, reduction, racemisation, polymerization. BCS classification of drugs. Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.	7 Hours	15.55%

2.	Tablets, Liquid orals Introduction, ideal characteristics of tablets, classification of tablets. Excipients, formulation of tablets, granulation methods, compression and processing problems. Equipment and tablet tooling. Tablet coating: Types of coating, coating	10 Hours	22.22%
	materials, formulation of coating composition, methods of coating, equipment employed and defects in coating. Quality control tests: In process and finished product tests. Formulation and manufacturing consideration of solutions, suspensions and emulsions; filling and packaging; evaluation of liquid orals official in pharmacopoeia.		
3.	Capsules, Pellets Hard gelatin capsules: Introduction, extraction of gelatin and production of hard gelatin capsule shells. Size of capsules, filling, finishing and special techniques of formulation of hard gelatin capsules. In process and final product quality control tests for capsules. Soft gelatin capsules: Nature of shell and capsule content, size of capsules, importance of base adsorption and minimum/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules Introduction, formulation requirements, palletization process, equipment for manufacture of pellets	8 Hours	17.77%
4.	Parenteral Products, Ophthalmic Preparations Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity. Production procedure, production facilities and controls. Formulation of injections, sterile powders, emulsions, suspensions, large volume parenterals and lyophilized products, sterilization. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests. Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations	10 Hours	22.22%

5. Cosmetics, Pharmaceutical Aerosols, Packaging Materials Science Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, toothpastes, hair dyes and sunscreens. Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies. Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.	10 Hours	22.22%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	summarize the concept of preformulation.
CO2	describe the various pharmaceutical dosage forms and their manufacturing techniques.
CO3	comprehend the different cosmetic products.
CO4	write methods for assessing quality attributes of pharmaceutical dosage forms.
CO5	describe and rationalize need base selection of packaging materials.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11
CO1	3	-	3	-	-	-	-	-	-	-	3
CO2	3	-	3	-	-	-	-	-	-	-	-
CO3	3	-	3	-	-	-	-	-	-	-	3
CO4	3	-	3	-	-	-	-	-	-	-	-
CO5	3	-	3	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH 5002P: INDUSTRIAL PHARMACY-I (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	Title of the Unit
1	Preformulation study for prepared granules
2	Preparation and evaluation of paracetamol tablets
3	Preparation and evaluation of aspirin tablets
4	Coating of tablets
5	DRC of acetylcholine using frog rectus abdominis muscle
6	Preparation of calcium gluconate injection
7	Preparation of ascorbic acid injection
8	Preparation of paracetamol syrup
9	Preparation of eye drops
10	Preparation of pellets by extrusion spheronization technique
11	Preparation of creams (cold / vanishing cream)
12	Evaluation of glass containers

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	perform preformulation studies for different dosage forms
CO2	formulate and evaluate different sterile and non-sterile dosage forms
CO3	operate instruments for preparation of various dosage forms
CO4	conduct the quality control test of the marketed solid dosage forms as per compendial methods
CO5	carry out necessary calculations, prepare the report and justify the approach

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	-	-	-	-	-	-	-	3
CO2	3	-	3	3	-	-	-	-	-	-	3
CO3	3	-	-	3	-	-	-	-	-	-	3
CO4	3	3	3	-	-	-	-	-	2	-	-
CO5	3	3	3	-	-	-	-	-	-	-	-

Recommended Study Material:

❖ Textbook:

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman & J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E. Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C. Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.
10. Pharmaceutical Packaging Technology edited by D.A. Dean, E. R. Evans, Taylor and Francis, New York
11. Indian Pharmacopoeia, published by Indian Pharmacopoeial commission, Ghaziabad.
12. United State Pharmacopoeia, Indian edition, United State Pharmacopoeial convention INC.
13. British Pharmacopoeia, British Pharmacopoeia commission office, U.K.
14. Handbook of Preformulations, S. K. Niazi, Informa Healthcare, New York.
15. Pharmaceutical Preformulations & Formulation, edited by Marks Gibson, Interpharm/CRC, Boca Raton, Florida, USA.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH5003: PHARMACOLOGY-II (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Pharmacology of drugs acting on cardiovascular system	07
2	Pharmacology of drugs acting on cardiovascular system	10
	Pharmacology of drugs acting on urinary system	
3	Autocoids and related drugs	08
4	Pharmacology of drugs acting on endocrine system	10
5	Pharmacology of drugs acting on endocrine system	10
	Bioassay	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Pharmacology of Drugs Acting on Cardiovascular System Introduction to hemodynamic and electrophysiology of heart. Drugs used in congestive heart failure. Anti-hypertensive drugs. Anti-anginal drugs. Anti-arrhythmic drugs. Anti-hyperlipidemic drugs.	7 Hours	15.55%
2.	Pharmacology of Drugs Acting on Cardio Vascular System, Pharmacology of Drugs Acting on Urinary System Drug used in the therapy of shock. Hematinics, coagulants and anticoagulants. Fibrinolytics and anti-platelet drugs. Plasma volume expanders. Diuretics. Anti-diuretics	10 Hours	22.22%
3.	Autocoids and Related Drugs Introduction to autocoids and classification. Histamine, 5-HT and their antagonists. Prostaglandins, thromboxanes and leukotrienes. Angiotensin, bradykinin and substance P. Non-steroidal anti-inflammatory agents. Anti-gout drugs. Antirheumatic drugs.	8 Hours	17.77%
4.	Pharmacology of Drugs Acting on Endocrine System Basic concepts in endocrine pharmacology. Anterior Pituitary hormones- analogues and their inhibitors. Thyroid hormones-analogues and their inhibitors. Hormones regulating plasma calcium level- parathormone, calcitonin and vitamin-D.	10 Hours	22.22%

	Insulin, oral hypoglycemic agents and glucagon. ACTH and corticosteroids.		
5.	Pharmacology of Drugs Acting on Endocrine System, Bioassay Androgens and anabolic steroids. Estrogens, progesterone and oral contraceptives. Drugs acting on the uterus. Principles and applications of bioassay. Types of bioassays. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine.	10 Hours	22.22%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	classify and provide specific examples for drugs affecting the cardiovascular system, urinary system, endocrine system and autacoids
CO2	describe and compare mechanism of action, adverse effects and contraindications for drugs affecting on cardiovascular system, urinary system, endocrine system and autacoids
CO3	illustrate clinical conditions with suggestion and justify the appropriate use of drugs in the particular disease conditions
CO4	summarize and suggest the assay of drugs <i>in vitro</i> and <i>in vivo</i> .

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	3	-	-	-	-	-	-	-	-
CO3	3	-	3	-	-	-	-	3	-	-	3
CO4	3	-	3	-	-	-	-	3	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH5003P: PHARMACOLOGY-II (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	Title of the Unit
1	Introduction to <i>in vitro</i> pharmacology and physiological salt solutions
2	Effect of drugs on isolated frog heart
3	Effect of drugs on blood pressure and heart rate of dog
4	Study of diuretic activity of drugs using rats/mice
5	DRC of acetylcholine using frog rectus abdominis muscle
6	Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively
7	Bioassay of histamine using guinea pig ileum by matching method
8	Bioassay of oxytocin using rat uterine horn by interpolation method
9	Bioassay of serotonin using rat fundus strip by three point bioassay
10	Bioassay of acetylcholine using rat ileum/colon by four point bioassay
11	Determination of PA2 value of prazosin using rat anococcygeus muscle (by Schild's plot method)
12	Determination of PD2 value using guinea pig ileum
13	Anti-inflammatory activity of drugs using carrageenan induced paw-edema model
14	Analgesic activity of drug using central and peripheral methods

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	perform isolated tissue based experiments
CO2	perform various receptor activity using isolated tissue preparation
CO3	observe and suggest the rationale for demonstrated drug screening experiments
CO4	quantify drugs using various <i>in vivo</i> and <i>in vitro</i> experiments
CO5	carry out necessary calculations, draw the results and justify the conclusion

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	3
CO3	3	-	3	-	-	-	-	3	-	-	3
CO4	3	3	3	-	-	-	-	-	-	-	-
CO5	-	-	3	3	-	-	-	3	-	-	-

Recommended Study Material:**❖ Textbook:**

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology.
6. K.D. Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R. Craig & Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

FACULTY OF PHARMACY

Bachelor of Pharmacy Programme

BPH5004: PHARMACOGNOSY-II (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Metabolic pathways in higher plants and their determination	7
2	General introduction, composition, chemistry and chemical classes, general methods of extraction and analysis, biosources, therapeutic uses and commercial applications of secondary metabolites	14
3	Isolation, identification and analysis of phytoconstituents	6
4	Industrial production, estimation and utilization of the following phytoconstituents	10
5	Basics of phytochemistry	8

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Metabolic pathways in higher plants and their determination Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- shikimic acid pathway, acetate pathways and amino acid pathway. Study of utilization of radioactive isotopes in the investigation of biogenetic studies.	7 Hours	15.55%
2.	General introduction, composition, chemistry and chemical classes, general methods of extraction and analysis, biosources, therapeutic uses and commercial applications of secondary metabolites	14 Hours	31.11%

	Alkaloids, phenylpropanoids and flavonoids, steroids, cardiac glycosides and triterpenoids, volatile oils, tannins, resins, glycosides, iridoids, other terpenoids and naphthaquinones. Vinca, rauwolfia, belladonna, opium Lignans, tea, ruta Liquorice, dioscorea Mentha, clove, cinnamon, fennel, coriander Catechu, pterocarpus, myrobalan, amla		
	Benzoin, guggul, ginger, asafoetida, myrrh, colophony Senna, aloes, bitter almond Gentian, artemisia, taxus, carotenoids		
3.	Isolation, Identification and Analysis of Phytoconstituents Terpenoids: menthol, citral, artemisin Glycosides: glycyrhetic acid and rutin Alkaloids: atropine, quinine, reserpine, caffeine Resins: podophyllotoxin, curcumin	6 Hours	13.33%
4.	Industrial Production, Estimation and Utilization of the Following Phytoconstituents Forskolin, sennoside, artemisinin, diosgenin, digoxin, atropine, podophyllotoxin, caffeine, taxol, vincristine and vinblastine	10 Hours	22.22%
5.	Basics of Phytochemistry Modern methods of extraction, application of latest techniques like spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.	8 Hours	17.77%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe radio tracer technique and biogenesis of metabolites in higher plants
CO2	summarize pharmacognosy of selected plant drugs
CO3	compare and contrast selected medicinal plants
CO4	suggest, justify and describe appropriate extraction technique
CO5	summarize the methods of industrial production, quality control and application of selected phyto-constituents
CO6	suggest applications of chromatography and spectroscopy in phytochemical analysis

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	-	-	-	-	-	-	-	-
CO2	2	-	2	-	-	-	-	-	-	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-
CO4	2	-	2	-	-	-	-	-	-	-	2
CO5	3	-	2	-	-	-	-	-	-	-	-
CO6	3	-	2	3	-	-	-	-	-	-	2

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH5004P: PHARMACOGNOSY -II (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.No.	Title of the Practical
1	Morphology, histology and powder characteristics and extraction and detection of cinchona, cinnamon, senna, clove, ephedra, fennel and coriander
2	Exercise involving isolation and detection of active principles a. Caffeine - from tea dust b. Diosgenin from Dioscorea c. Atropine from Belladonna d. Sennosides from Senna
3	Separation of sugars by paper chromatography
4	TLC of herbal extract
5	Distillation of volatile oils and detection of phytoconstituents by TLC
6	Analysis of crude drugs by chemical tests a. Asafoetida b. Benzoin c. Colophony d. Aloes e. Myrrh

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	carry out morphological and microscopic evaluation of plant drugs
CO2	identify plant drugs powder through microscopic assessment and carry out phytochemical tests
CO3	perform thin layer chromatography of plant extract
CO4	separate phytoconstituents and ensure identity using TLC
CO5	prepare the reports and draw the conclusion

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	2	3	-	-	-	-	-	-	-
CO2	2	-	2	3	-	-	-	-	-	-	-
CO3	2	3	2	3	-	-	-	3	-	-	-
CO4	2	3	2	3	-	-	-	3	-	-	2
CO5	-	-	2	-	-	-	-	3	-	-	-

Recommended Study Material:

❖ Textbook:

- 1 W.C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
- 2 Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi
- 3 Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
- 4 Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
- 5 Essentials of Pharmacognosy, Dr.SH.Ansari, IIInd edition, Birla publications, New Delhi, 2007
- 6 Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
- 7 A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
- 8 R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
- 9 Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
- 10 The formulation and preparation of cosmetic, fragrances and flavours.
- 11 Remington's Pharmaceutical sciences.
- 12 Textbook of Biotechnology by Vyas and Dixit.
- 13 Textbook of Biotechnology by R.C. Dubey.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH5005: PHARMACEUTICAL JURISPRUDENCE (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Drugs and Cosmetics Act, 1940 and its rules 1945	10
2	Drugs and Cosmetics Act, 1940 and its Rules 1945	10
3	Pharmacy Act –1948 Medicinal and Toilet Preparation Act –1955 Narcotic Drugs and Psychotropic Substances Act-1985 and Rules	10
4	Study of Salient Features of Drugs and Magic Remedies Act 1954 and its Rules Prevention of Cruelty to Animals Act-1960 National Pharmaceutical Pricing Authority	8
5	Pharmaceutical Legislations Code of Pharmaceutical Ethics Medical Termination of Pregnancy act Right to Information Act Introduction to Intellectual Property Rights (IPR)	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Drugs and Cosmetics Act, 1940 and its Rules 1945 Objectives, definitions, legal definitions of schedules to the act and rules. Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties. Manufacture of drugs – Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.	10 Hours	22.22%

2	Drugs and Cosmetics Act, 1940 and its Rules 1945 Detailed study of Schedule G, H, M, N, P, T, U, V, X, Y, Part XII B, Sch F and DMR (OA).	10 Hours	22.22%
	Sale of Drugs – Wholesale, retail sale and restricted license. offences and penalties. Labeling and packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, list of permitted colors. Offences and penalties. Administration of the act and rules – Drugs technical advisory board, central drugs laboratory, drugs consultative committee, government drug analysts, licensing authorities, controlling authorities, drugs inspectors.		
3.	Pharmacy Act –1948, Medicinal and Toilet Preparation Act –1955, Narcotic Drugs and Psychotropic Substances Act-1985 and Rules Objectives, definitions, pharmacy council of India; its constitution and functions, education regulations, state and joint state pharmacy councils; its constitution and functions, registration of pharmacists, offences and penalties. Objectives, definitions, licensing, manufacture in bond and outside bond, export of alcoholic preparations, manufacture of ayurvedic, homeopathic, and patent and proprietary preparations. offences and penalties. Objectives, definitions, authorities and officers, constitution and functions of narcotic and psychotropic consultative committee, national fund for controlling the drug abuse, prohibition, control and regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, offences and penalties.	10 Hours	22.22%
4.	Study of Salient Features of Drugs and Magic Remedies Act 1954 and its Rules, Prevention of Cruelty to animals Act-1960, National Pharmaceutical Pricing Authority	8 Hours	17.77%

	Objectives, definitions, prohibition of certain advertisements, classes of exempted advertisements, offences and penalties. Objectives, definitions, institutional animal ethics committee, breeding and stocking of animals, performance of experiments, transfer and acquisition of animals for experiment, records, power to suspend or revoke registration, offences and penalties. Drugs price control order (DPCO) - 2013. Objectives, definitions, sale prices of bulk drugs, retail price of formulations, retail price and ceiling price of scheduled formulations, national list of essential medicines (NLEM).		
5.	Pharmaceutical Legislations, Code of Pharmaceutical Ethics, Medical Termination of Pregnancy Act, Right to Information Act, Introduction to Intellectual Property Rights (IPR)	7 Hours	15.55%
A brief review, introduction, study of drugs enquiry committee, health survey and development committee, Hathi committee and Mudaliar committee. Definition, pharmacist in relation to his job, trade, medical profession and his profession, pharmacist's oath. Introduction, termination of pregnancies, offences and penalties.			

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	summarize and interpret Drugs and Cosmetics Act, 1940 and its rules 1945
CO2	analyse and infer pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals
CO3	describe the regulations governing the experiments on animals
CO4	apply the code of ethics during the pharmaceutical practice and intellectual property rights

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	-	-	3	3	-	3	-	2
CO2	2	-	2	-	-	3	3	-	3	-	2
CO3	2	3	-	-	-	-	3	-	3	-	2
CO4	1	-	-	-	-	-	3	-	3	-	-

Recommended Study Material:

❖ Textbook:

1. Forensic Pharmacy by B. Suresh 124
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication
9. Bare Acts of the said laws published by Government. Reference books (Theory)

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

HS 131.02 B: COMMUNICATION AND SOFT SKILLS

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	30/15	--	30/15	02
Marks	--	100	--	100	

Pre-requisite courses:

- Communicative English

Objectives of the Course:

- To hone and sharpen communication skills of students
- To prepare globally and multi-culturally competent communicators and professionally compatible cadre of future professionals
- To equip and empower students to qualify and successfully clear all the phases of selection procedure for on and off campus interviews

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	An Introduction to Communication	06
2.	Cross-cultural Communication and Globalization	03
3.	Communication for Career Building	10
4.	Group Dynamics and Soft Skills	05
5.	Effective Presentation Strategies	04
6.	Contemporary Issues in Communication and Soft Skills	02

Total hours (Theory): --

Total hours (Practical): 30

Total hours: 30

Detailed Syllabus:

1.	An Introduction to Communication	06 Hours	20%
	Basics of communication: origin, concept, process, levels, principles and barriers; applications of communication; rhetoric in professional communication; importance of ethos, logos and pathos in communication.		
2.	Cross-cultural Communication and Globalization	03 Hours	10%

	Basic concepts: culture, globalization and cross-cultural communication; social and people skills; communicating with		
	people of different cultures; conflicts in cross-cultural communication and tactics/techniques to resolve them; persuasive communication		
3.	Communication for Career Building	10 Hours	33%
	Cover letters and resume, e-mail and report, types of resume, concept and rationale of group discussion skills and aspects assessed in group discussion, concept and rationale of personal interview, types of personal interview, writing statement of purpose		
4.	Group Dynamics and Soft Skills	05 Hours	17%
	An introduction to group dynamics and soft skills, groups and their structures, roles and functions of members in groups, conflict management, aptitude and attitude, various intelligences, developing an open mindset		
5.	Effective Presentation Strategies	04 Hours	14%
	Designing appealing presentation, audience analysis and supporting material, presentation mechanics and presentation process, managing yourself during q and a session, fundamentals of persuasion		
6.	Contemporary Issues in Communication and Soft Skills	02 Hours	06%
	Trends and practices in communication, case studies		

Course Outcome (COs):

At the end of the course, the students will be able to

CO1	gain thorough understanding and proficiency in various professional communication skills
CO2	develop awareness and competence in cross-cultural communication in their personal, academic and professional environments
CO3	develop business writing and presentation skills to succeed in career
CO4	develop soft skills to stand out and take their career to the next level
CO5	develop various intelligences and open mindset to function in multi-disciplinary and cross-cultural work environment
CO6	practice new trends in communication in multiple perspectives at personal, professional, and social level

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	3	-	-	-
CO2	-	-	-	-	-	-	-	3	-	-	2
CO3	-	-	-	-	-	-	-	3	-	-	-

CO4	-	-	-	-	-	3	-	3	-	-	-
CO5	-	-	-	-	3	-	-	3	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	3

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation, put “-”

Recommended Study Material:

❖ Text book:

3. Koneru, A. Professional Communication, Tata McGraw Hill Education Private Limited
4. Disanza, J.R. & Legge, N. Business and Professional Communication, Pearson Education
5. Raman, M & Singh, P. Business Communication, Oxford University Press

❖ Reference book:

4. Disanza, J.R. & Legge, N. Business and Professional Communication, Pearson Education
5. Anandamurugan, A. Placement Interviews – Skills for Success, Tata McGraw Hill Education Private Limited

❖ Web material:

1. <https://www.coursera.org/learn/careerdevelopment>
2. <https://www.futurelearn.com/courses/writing-applications>
3. <https://www.futurelearn.com/courses/workplace-english>

FACULTY OF PHARMACY

Bachelor of Pharmacy Programme

SYLLABI

(Semester – VI)

**CHAROTAR UNIVERSITY OF SCIENCE
AND TECHNOLOGY**

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH6001 MEDICINAL CHEMISTRY-II (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Antihistaminic agents	10
	H1-antagonists	
	H2-antagonists	
	Gastric proton pump inhibitors	
	Anti-neoplastic agents	
	Alkylating agents	
	Antimetabolites	
	Antibiotics	
	Plant products	
	Miscellaneous	
2	Anti-anginal	10
	Vasodilators	
	Calcium channel blockers	
	Diuretics	
	Carbonic anhydrase inhibitors	
	Thiazides	
	Loop diuretics	
	Potassium sparing diuretics	
	Osmotic diuretics	
	Anti-hypertensive agents	
3	Anti-arrhythmic drugs	10
	Anti Hyperlipidaemic agents	
	Coagulant and anticoagulant	
	Drugs used in congestive heart failure	
4	Drugs acting on endocrine system	8
	Sex hormones	
	Drugs for erectile dysfunction	
	Oral contraceptives	
5	Antidiabetic agents	7
	Insulin and its preparations	

Sulfonyl ureas	
Thiazolidinediones	
Meglitinides	
Glucosidase inhibitors	
Local anesthetics	
Amino benzoic acid derivatives	
Lidocaine/anilide derivatives	

Detailed Syllabus:

Study of the development of the following classes of drugs, classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

Sr. No.	UNIT	Hours	Weightage (%)
1.	<p>Antihistaminic agents, H1–antagonists, H2-antagonists, Gastric Proton Pump Inhibitors, Anti-neoplastic agents, Alkylating agents, Antimetabolites, Antibiotics, Plant Products, Miscellaneous</p> <p>H1–antagonists: Diphenhydramine Hydrochloride*, Dimenhydrinate, Doxylamines Cuccinate, Clemastine Fumarate, Diphenylphyraline Hydrochloride, Tripelenamine Hydrochloride, Chlorcyclizine Hydrochloride, Meclizine Hydrochloride, Buclizine Hydrochloride, Chlorpheniramine Maleate, Triprolidine Hydrochloride*, Phenidamine Tartarate, Promethazine Hydrochloride*, Trimeprazine Tartrate, Cyproheptadine Hydrochloride, Azatidine Maleate, Astemizole, Loratadine, Cetirizine, Levocetirizine Cromolyn Sodium.</p> <p>H2-Antagonists: Cimetidine*, Famotidine, Ranitidine.</p> <p>Gastric Proton Pump Inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole.</p> <p>Anti-Neoplastic Agents: Alkylating Agents: Meclorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa.</p> <p>Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine.</p> <p>Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin.</p> <p>Plant Products: Etoposide, Vinblastin Sulphate, Vincristin Sulphate.</p>	10 Hours	22.22%

	Miscellaneous: Cisplatin, Mitotane		
2.	Anti-anginal, Vasodilators, Calcium Channel Blockers, Diuretics, Carbonic Anhydrase Inhibitors, Thiazides, Loop Diuretics, Potassium Sparing Diuretics, Osmotic Diuretics, Anti-hypertensive Agents Anti-anginal Vasodilators: Amyl Nitrite, Nitroglycerin*, Pentaerythritol Tetranitrate, Isosorbide Dinitrite*, Dipyridamole. Calcium channel blockers: Verapamil, Bepridil Hydrochloride, Diltiazem Hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine. Diuretics Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide. Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide. Loop Diuretics: Furosemide*, Bumetanide, Ethacrynic Acid. Potassium Sparing Diuretics: Spironolactone, Triamterene, Amiloride. Osmotic Diuretics: Mannitol Anti-hypertensive Agents Timolol, Captopril, Lisinopril, Enalapril, Benazepril Hydrochloride, Quinapril Hydrochloride, Methyldopate Hydrochloride,* Clonidine Hydrochloride, Guanethidine Monosulphate, Guanabenz Acetate, Sodium Nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine Hydrochloride.	10 Hours	22.22%
3.	Anti-arrhythmic Drugs, Anti Hyperlipidemic Agents, Coagulant and Anticoagulant, Drugs Used in Congestive Heart Failure Anti-arrhythmic Drugs: Quinidine Sulphate, Procainamide Hydrochloride, Disopyramide Phosphate*, Phenytion Sodium, Lidocaine Hydrochloride, Tocainide Hydrochloride, Mexiletine Hydrochloride, Lorcainide Hydrochloride, Amiodarone, Sotalol. Anti-Hyperlipidemic Agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol. Coagulant and Anticoagulants: Menadione, Acetomenadione, Warfarin*, Anisindione, Clopidogrel. Drugs Used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.	10 Hours	22.22%
4.	Drugs Acting on Endocrine System, Sex Hormones, Drugs for Erectile Dysfunction, Oral Contraceptives, Corticosteroids, Thyroid and Anti-Thyroid Drugs	8 Hours	17.77%

	Drugs acting on Endocrine system: Nomenclature, Stereochemistry And Metabolism of Steroids. Sex Hormones: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl Stilbestrol. Drugs for Erectile Dysfunction: Sildenafil, Tadalafil. Oral Contraceptives: Mifepristone, Norgestrel, Levonorgestrel Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone. Thyroid And Antithyroid Drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.		
5.	Antidiabetic Agents, Insulin and its Preparations, Sulfonyl ureas, Thiazolidinediones, Meglitinides, Glucosidase Inhibitors, Local Anesthetics, Amino Benzoic acid derivatives, Lidocaine/Anilide derivatives: Antidiabetic Agents: Insulin And Its Preparations. Sulfonyl Ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride, Biguanides: Metformin. Thiazolidinediones: Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide. Glucosidase Inhibitors: Acarbose, Voglibose. Local Anesthetics: SAR of Local Anesthetics. Benzoic Acid Derivatives: Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine. Amino Benzoic Acid Derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate. Lidocaine/Anilide Derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine. Miscellaneous: Phenacaine, Diperodon, Dibucaine.*	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe chemistry of various category of drugs with respect to their pharmacological activity
CO2	summarize structural activity relationship of different class of drugs
CO3	illustrate the drug metabolic pathways and its impact on adverse effect and therapeutic effect of drugs
CO4	suggest, categorise and outline the chemical synthetic pathways of selected drugs

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	2	-	-	-	-	-	-	-	-
CO2	2	-	2	-	-	-	-	-	-	-	2
CO3	2	-	2	-	-	-	-	-	-	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH6002: PHARMACOLOGY-III (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Pharmacology of Drugs acting on Respiratory System	10
	Pharmacology of Drugs Acting on the Gastrointestinal Tract	
2	Chemotherapy	10
3	Chemotherapy	10
4	Chemotherapy	8
	Immunopharmacology	
5	Principles of Toxicology	7
	Chronopharmacology	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Pharmacology of Drugs acting on Respiratory System, Pharmacology of drugs acting on the Gastrointestinal Tract Anti -asthmatic drugs, drugs used in the management of COPD, expectorants and antitussives, nasal decongestants, respiratory stimulants Antiucler agents, drugs for constipation and diarrhea, appetite stimulants and suppressants, digestants and carminatives, emetics and anti-emetics.	10 Hours	22.22%
2.	Chemotherapy General principles of chemotherapy, sulfonamides and cotrimoxazole, penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides.	10 Hours	22.22%
3.	Chemotherapy Antitubercular agents, antileprotic agents, antifungal agents, antiviral drugs, anthelmintics, antimalarial drugs, antiamoebic agents	10 Hours	22.22%
4.	Chemotherapy of Neoplastic Diseases and Miscellaneous Drugs	8 Hours	17.77%

	Urinary tract infections and sexually transmitted diseases. Chemotherapy of malignancy. Immunostimulants, immunosuppressant, protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars		
5.	Principles of toxicology, Chronopharmacology Definition and basic knowledge of acute, subacute and chronic toxicity. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity. General principles of treatment of poisoning. Clinical symptoms and management of barbiturates, morphine, organophosphorus compound and lead, mercury and arsenic poisoning Definition of rhythm and cycles. Biological clock and their significance leading to chronotherapy.	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	classify and describe mechanism of action of drugs affecting respiratory and GI system
CO2	describe therapeutic use, adverse effects and contraindications of drugs affecting respiratory and GI system
CO3	classify and describe pharmacology of various chemotherapeutic agents
CO4	evaluate clinical conditions and justify the use of drugs modulating the immunity
CO5	comprehend the principles of toxicology, toxicity studies and treatment of various poisonings.
CO6	describe the concept of protein based drugs, biosimilars and chronopharmacology

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	3	-	-	-	-	-	-	-	-
CO3	3	-	3	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	3	-	-	3
CO5	3	-	3	-	-	-	-	-	-	-	-
CO6	3	-	-	-	-	-	-	-	-	-	-

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH6002P: PHARMACOLOGY-III (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	List of Practical
1.	Dose calculation in pharmacological experiments
2.	Anti-allergic activity by mast cell stabilization assay
3.	Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model
4.	Study of effect of drugs on gastrointestinal motility
5.	Effect of agonist and antagonists on guinea pig ileum
6.	Estimation of serum biochemical parameters by using semi- autoanalyser
7.	Effect of saline purgative on frog intestine
8.	Insulin hypoglycemic effect in rabbit
9.	Test for pyrogens (rabbit method)
10.	Determination of acute oral toxicity (LD_{50}) of a drug from a given data
11	Determination of acute skin irritation/corrosion of a test substance
12	Determination of acute eye irritation/corrosion of a test substance
13	Calculation of pharmacokinetic parameters from a given data
14	Biostatistics methods in experimental pharmacology (Student's t test, ANOVA)
15	Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	observe and suggest the rationale for demonstrated drug screening experiments
CO2	determine biochemical parameters
CO3	observe and assess toxicity <i>in vivo</i>
CO4	perform isolated tissues based experiments
CO5	determine drug dose and pharmacokinetic parameters
CO6	apply principles of statistical significance for pharmacological experimental data

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	-	-	-	3	-	-	3
CO2	3	3	3	3	-	-	-	-	-	-	3
CO3	3	-	3	-	-	-	-	-	-	-	-
CO4	3	-	3	-	-	-	-	-	-	-	3
CO5	3	-	3	-	-	-	-	-	-	-	-

CO6	3	-	3	3	-	-	-	3	-	-	-
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Recommended Study Material:

❖ **Textbook:**

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology
6. K.D. Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R. Craig& Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
9. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan
10. N. Udupa and P.D. Gupta, Concepts in Chronopharmacology

❖ **Web Materials:**

1. <http://heb-nic.in/ex-pharm>
2. https://www.researchgate.net/publication/287995503_Guidelines_on_dosage_calculation_and_stock_solution_preparation_in_experimental_animals'_studies
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1637006/>
4. <https://msmedia.com.au/pharmacology-software>

FACULTY OF PHARMACY

Bachelor of Pharmacy Programme

BP6003: HERBAL DRUG TECHNOLOGY (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Herbs as Raw Materials	11
	Biodynamic Agriculture	
	Indian Systems of Medicine	
2	Nutraceuticals	7
	Herbal-Drug and Herb-Food Interactions	
3	Herbal Cosmetics	7
	Herbal Excipients	
	Herbal Formulations	
4	Evaluation of Drugs	10
	Stability Testing of Herbal Drugs	
	Patenting and Regulatory Requirements of Natural Products	
	Regulatory Issues	
5	General Introduction to Herbal Industry	10
	Schedule T – Good Manufacturing Practice of Indian Systems of Medicine	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Herbs as Raw Materials, Biodynamic Agriculture, Indian Systems of Medicine Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation. Source of herbs. Selection, identification and authentication of herbal materials. Processing of herbal raw material. Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and pest management in medicinal plants: Biopesticides/Bioinsecticides. Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy. Preparation and standardization of Ayurvedic formulations <i>viz</i> aristas and asawas, ghutika, churna, lehya, taila, ghrita and bhasma.	11 Hours	24.44%
2.	Nutraceuticals, Herbal-Drug and Herb-Food Interactions,		15.55%

	General aspects, market, growth, scope and types of products available in the market. Health benefits and role of nutraceuticals in ailments like diabetes, CVS diseases, Cancer, irritable bowel syndrome and various gastrointestinal diseases. Study of following herbs as health food: alfaalfa, chicory, ginger, fenugreek, garlic, honey, amla, ginseng, ashwagandha, spirulina. General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: hypercium, kava-kava, ginko biloba, ginseng, garlic, pepper and ephedra.	7 Hours	
3.	Herbal Cosmetics, Herbal Excipients, Herbal Formulations Sources and description of raw materials of herbal origin used <i>viz</i> fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products. Herbal excipients: significance of substances of natural origin as excipients. Colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors and perfumes. Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes	7 Hours	15.55%
4.	Evaluation of Drugs, Stability Testing of Herbal Drugs, Patenting and Regulatory Requirements of Natural Products, Regulatory Issues WHO and ICH guidelines for the assessment of herbal drugs. Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy. Patenting aspects of traditional knowledge and natural products. Case study of curcuma and neem. Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.	10 Hours	22.22%
5.	General Introduction to Herbal Industry, Schedule T – Good Manufacturing Practice of Indian Systems of Medicine Herbal drugs industry: Present scope and future prospects. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India. Components of GMP (Schedule – T) and its objectives. Infrastructural requirements, working space, storage area,	10 Hours	22.22%

	machinery and equipments, standard operating procedures, health and hygiene, documentation and records.		
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Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe the importance of herbs as raw materials and as active component in cosmetics and significance of good agricultural practices
CO2	summarize the concept of neutraceutical and suggest plant materials to be used as nutraceuticals
CO3	describe methods for preparation and suggest the approach to standardize herbal drugs, herbal formulation and ayurveda formulations
CO4	summarize and interpret the intellectual property issues related to herbal drugs
CO5	describe and summarize registration, regulations and manufacturing of herbal/ayurveda formulations in India and various countries
CO6	describe herb-drug and herb-food interaction with suitable examples

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	3
CO2	3	-	-	-	-	-	-	-	-	-	3
CO3	2	-	-	3	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	3
CO5	3	-	-	-	-	-	-	-	1	3	-
CO6	2	-	-	-	-	-	-	-	3	-	3

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH6003P: HERBAL DRUG TECHNOLOGY (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	List of Practicals
1.	To perform preliminary phytochemical screening of crude drugs
2.	Determination of the alcohol content of asava and arista
3.	Evaluation of excipients of natural origin
4.	Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation
5.	Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6.	Monograph analysis of herbal drugs from recent Pharmacopoeias
7.	Determination of aldehyde content
8.	Determination of phenol content
9.	Determination of total alkaloids

Course Outcome (Cos):

At the end of the course, the students would be able to

CO1	identify specific types of phyto-constituents from medicinal plants
CO2	evaluate (standardize) ayurveda and herbal formulations
CO3	quantify the group of phyto-constituents
CO4	prepare herbal formulations using extracts
CO5	interpret the results and suggest the compliance

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	3	-	-	-	-	-	-	-
CO2	2	-	-	3	-	-	-	-	-	-	-
CO3	2	-	-	3	-	-	-	-	-	-	-
CO4	2	-	-	3	-	-	-	-	-	-	-
CO5	-	-	3	-	-	-	-	3	-	-	-

Recommended Study Material:

❖ Textbook:

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale.
4. Essential of Pharmacognosy by Dr.S.H. Ansari.
5. Pharmacognosy & Phytochemistry by V.D. Rangari.
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy).
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

❖ Web Materials:

- 1.<https://nitte.edu.in/learningoutcomes/faculty-of-pharmacy/bpharm-1/herbal-drug-technology.html>
- 2.<https://www.sciencedirect.com/science/article/pii/B9780128202845000277>
- 3.<https://media.neliti.com/media/publications/278981-standardization-and-evaluation-of-herbal-ce0e9f33.pdf>

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH6004 INDUSTRIAL PHARMACY-II

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Pilot plant scale up techniques	10
2	Technology development and transfer	10
3	Regulatory affairs	10
	Regulatory requirements for drug approval	
4	Quality management systems	8
5	Indian regulatory requirements	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Pilot Plant Scale Up Techniques General considerations - including significance of personnel requirements, space requirements, raw materials. Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation. SUPAC guidelines and introduction to platform technology	10 Hours	22.22%
2.	Technology Development and Transfer WHO guidelines for Technology Transfer (TT): terminology, technology transfer protocol, quality risk management, transfer from R & D to production (process, packaging and cleaning), granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipment, qualification and validation, quality control, analytical method transfer, approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE/SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues	10 Hours	22.22%
3.	Regulatory Affairs Introduction, historical overview of regulatory affairs, regulatory authorities, role of regulatory affairs department, responsibility of regulatory affairs professionals.	10 Hours	22.22%

	Drug development teams, non-clinical drug development, pharmacology, drug metabolism and toxicology, general considerations of investigational new drug (IND) application, investigator's brochure (IB) and new drug application (NDA), clinical research/BE studies, clinical research protocols. Biostatistics in pharmaceutical product development, data presentation for FDA submissions, management of clinical studies.		
4.	Quality Management Systems Quality management and certifications: Concept of quality, total quality management, quality by design (QbD), six sigma concept, out of specifications (OOS), change control. Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP	8 Hours	17.77%
5.	Indian Regulatory Requirements Central drug standard control organization (CDSCO) and state licensing authority: organization, responsibilities. Certificate of pharmaceutical product (COPP), regulatory requirements and approval procedures for new drugs.	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe the process of pilot plant and scale up for various pharmaceutical dosage forms
CO2	comprehend the process of technology transfer and commercialization
CO3	describe role of quality management systems in pharmaceutical industries
CO4	narrate various laws and acts in pharmaceutical industry for drug approval

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	-	-	-	-	-	-	-
CO2	3	-	3	-	-	-	-	-	-	-	3
CO3	3	3	3	-	-	-	-	-	2	-	-
CO4	3	-	-	-	-	-	3	-	2	-	3

Recommended Books: (Latest Editions)

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http://en.wikipedia.org/wiki/Regulatory_Affairs
2. International Regulatory Affairs Updates, 2005. Available at <http://wwwираup.com/about.php>
3. Douglas J Pisano and David S. Mantus. Textbook of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics‘Second Edition.
4. Regulatory Affairs brought by learning plus, inc. available at <http://www.cgmp.com/ra.htm>
5. Vyawahare, N., & Itkar, S. C. Drug Regulatory Affairs: Nirali Prakashan.
6. Patravale, V. B., Disouza, J. I., & Rustomjee, M. (2016). Pharmaceutical Product Development: Insights into Pharmaceutical Processes, Management and Regulatory Affairs: CRC Press.
7. Anjaneyulu, Y., & Marayya, R. (2005). Quality Assurance and Quality Management In Pharmaceutical Industry: Book Syndicate.
8. Levin, M. (2011). Pharmaceutical Process Scale-Up, Third Edition: Taylor & Francis.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH6005: PHARMACEUTICAL BIOTECHNOLOGY (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Brief introduction to Biotechnology	10
	Enzyme Biotechnology	
	Biosensors	
	Brief introduction to Protein Engineering	
	Use of microbes in Industry	
	Basic Principles of Genetic Engineering	
2	Study of Cloning Vectors, Restriction Endonucleases and DNA Ligase	10
	Recombinant DNA Technology	
	Application of rDNA Technology and Genetic Engineering	
	Brief Introduction to PCR	
3	Types of Immunity- Humoral Immunity, Cellular Immunity	10
4	Immuno Blotting Techniques	8
	Genetic Organization of Eukaryotes and Prokaryotes	
	Microbial Genetics	
	Introduction to Microbial Biotransformation	
	Mutation	
5	Fermentation Methods	7
	Large Scale Production Fermenter Design	
	Study of the Production of - Penicillins, Citric Acid, Vitamin B12, Glutamic Acid, Griseofulvin	
	Blood Products	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	UNIT-I Brief introduction to biotechnology with reference to pharmaceutical Sciences. Enzyme biotechnology: methods of enzyme immobilization and applications. Biosensors: working and applications of biosensors in Pharmaceutical Industries. Brief introduction to protein engineering. Use of microbes in industry. Production of Enzymes- general consideration amylase, catalase, peroxidase, lipase, protease, penicillinase. Basic principles of genetic engineering.	10 Hours	22.22%
2.	UNIT-II Study of cloning vectors, restriction endonucleases and DNA ligase. Recombinant DNA technology. Application of genetic engineering in medicine. Application of r DNA technology and genetic engineering in the production of: i) interferon ii) vaccines- hepatitis- B iii) hormones-insulin. Brief introduction to PCR	10 Hours	22.22%
3.	UNIT-III Types of immunity- humoral immunity, cellular immunity. Structure of Immunoglobulins, structure and function of MHC. Hypersensitivity reactions, immune stimulation and immune suppressions. General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity. Storage conditions and stability of official vaccines. Hybridoma technology- production, purification and applications. Blood products and plasma substitutes.	10 Hours	22.22%
4.	UNIT-IV	8	17.77%

	Immuno blotting techniques- ELISA, Western blotting, Southern blotting. Genetic organization of eukaryotes and prokaryotes. Microbial genetics including transformation, transduction, conjugation, plasmids and transposons. Introduction to Microbial biotransformation and applications. Mutation: types of mutation/mutants.	Hours	
5.	UNIT-V		15.55%
	Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. Large scale production fermenter design and its various controls. Study of the production of - penicillins, citric acid, vitamin B12, glutamic acid, griseofulvin. Blood products: collection, processing and storage of whole human blood, dried human plasma, plasma Substitutes.	7 Hours	

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe principle and application of various enzymes and protein engineering in pharmaceutical biotechnology
CO2	describe recombinant DNA technology and genetic engineering
CO3	describe the use of microorganisms in fermentation technology
CO4	summarize importance and application of biologics

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	-	-	-	-	-	-	3
CO2	3	-	3	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	3	-	-	-	-	-	-	-	3

Recommended Study Material:

❖ Textbook:

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
2. RA Goldshy et. al., Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.

6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

❖ **Web Materials:**

1. <https://www.khanacademy.org/science/ap-biology/gene-expression-and-regulation/biotechnology/v/dna-cloning-and-recombinant-dna>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7119977/>
3. https://www.nacalai.co.jp/global/download/pdf/western_blot_protocols.pdf
4. <https://www.creativebiomart.net/resource/principle-protocol-western-blot-protocol-351.htm>
5. <https://www.moleculardevices.com/applications/enzyme-linked-immunosorbent-assay-elisa#gref>
6. <https://www.mybiosource.com/learn/southern-blotting/>
7. <https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/fermentation-technique>
8. <https://www.britannica.com/science/mutation-genetics>

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH6006: INSTRUMENTAL METHODS OF ANALYSIS (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	UV Visible spectroscopy	10
	Fluorimetry	
2	IR Spectroscopy	10
	Flame Photometry	
	Atomic Absorption Spectroscopy	
	Nepheloturbidometry	
3	Introduction to Chromatography	10
	Electrophoresis	
4	Gas Chromatography	8
	High Performance Liquid Chromatography (HPLC)	
5	Ion Exchange Chromatography	7
	Gel Chromatography	
	Affinity Chromatography	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	UV Visible Spectroscopy, Fluorimetry UV visible spectroscopy: Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, derivation and deviations. Instrumentation - sources of radiation, wavelength selectors, sample cells, detectors- photo tube, photomultiplier tube, photo voltaic cell, silicon photodiode. Applications - spectrophotometric titrations, single component and multi component analysis Fluorimetry: Theory, concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications.	10 Hours	22.22%
2.	IR Spectroscopy, Flame Photometry, Atomic absorption Spectroscopy and Nepheloturbidometry	10 Hours	22.22%

	<p>IR spectroscopy: Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations. Instrumentation - sources of radiation, wavelength selectors, detectors - golay cell, bolometer, thermocouple, thermister, pyroelectric detector and applications</p> <p>Flame Photometry: principle, interferences, instrumentation and applications.</p> <p>Atomic absorption spectroscopy: principle, interferences, instrumentation and applications</p> <p>Nepheloturbidometry: principle, instrumentation and applications.</p>		
3.	<p>Introduction to Chromatography, Electrophoresis</p> <p>Introduction to chromatography</p> <p>Adsorption and partition column chromatography: Introduction, principle, methodology, advantages, disadvantages and applications.</p> <p>Thin layer chromatography: Introduction, principle, methodology, Rf values, advantages, disadvantages and applications.</p> <p>Paper chromatography: Introduction, methodology, development techniques, advantages, disadvantages and applications</p> <p>Electrophoresis: Introduction, factors affecting electrophoretic mobility, techniques of paper, gel, capillary electrophoresis, applications.</p>	10 Hours	22.22%
4.	<p>Gas chromatography, High Performance Liquid Chromatography (HPLC)</p> <p>Gas chromatography: Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications.</p>	8 Hours	17.77%
	<p>High performance liquid chromatography (HPLC): Introduction, theory, instrumentation, advantages and applications.</p>		
5.	<p>Ion exchange Chromatography, Gel Chromatography, and Affinity Chromatography</p>	7 Hours	15.55%

Ion exchange chromatography: Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications.

Gel chromatography: Introduction, theory, instrumentation and applications.

Affinity chromatography: Introduction, theory, instrumentation and applications.

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe the principle of various spectroscopic and chromatographic separation techniques
CO2	describe instrumentation and applications of various spectroscopic and chromatographic separation techniques
CO3	apply analytical techniques to solve the given problem
CO4	interpret the spectral data to identify functional groups and hybridization with justification for compounds

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	2	-	-	-	-	-	-	-	-
CO2	2	-	2	-	-	-	-	-	-	-	-
CO3	2	-	3	-	-	-	-	-	-	-	-
CO4	2	-	3	-	-	-	-	-	-	-	2

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH6006P: INSTRUMENTAL METHODS OF ANALYSIS (Practical)

Outline of the course:

Total hours: 60 Hr

Sr. No.	List of Practicals
1.	Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
2.	Estimation of dextrose by colorimetry
3.	Estimation of sulfanilamide by colorimetry
4.	Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
5.	Assay of paracetamol by UV spectrophotometry
6.	Estimation of quinine sulfate by fluorimetry
7.	Study of quenching of fluorescence
8.	Determination of sodium by flame photometry
9.	Determination of potassium by flame photometry
10.	Determination of chlorides and sulphates by nepheloturbidometry
11.	Separation of amino acids by paper chromatography
12.	Separation of sugars by thin layer chromatography
13.	Separation of plant pigments by column chromatography
14.	Demonstration experiment on HPLC
15.	Demonstration experiment on gas chromatography

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	analyze the drugs by colorimetry, UV-Vis spectrophotometry and fluorimetry
CO2	determine the amount of inorganic ions by flame photometry
CO3	apply various chromatographic techniques in separating the compounds
CO4	describe and differentiate the functionality and applications of sophisticated analytical instruments (HPLC, GC)
CO5	analyze the problem, communicate suggested solution and interpret the results

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	3	3	-	-	-	-	-	-	3
CO2	2	-	3	-	-	-	-	-	-	-	3
CO3	2	-	3	-	-	-	-	-	-	-	3
CO4	2	-	3	3	-	-	-	-	-	-	3
CO5	-	-	2	-	-	-	-	3	-	-	-

Recommended Study Material:

❖ Textbook:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Textbook of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein
11. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi,3rd Edition, CBS Publishers, New Delhi.
12. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi.
13. Indian Pharmacopoeia 2014, Ministry of Health and Family Welfare Volume – I, II, III. The Indian Pharmacopoeia Commission, Ghaziabad.

❖ Web Materials:

1. <https://freevideolectures.com/course/3029/modern-instrumental-methods-of-analysis>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206469/>
3. https://link.springer.com/chapter/10.1007/978-981-15-1547-7_2
4. <https://www.sciencedirect.com/science/article/pii/S0149639503800247>

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

HS132.02 B: CONTRIBUTORY PERSONALITY DEVELOPMENT

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	30/15	--	30/15	02
Marks	--	100	--	100	

Pre-requisite courses:

- Communication and Soft Skills

Objectives of the Course:

- Become familiar with basic concept of personality and personality development
- Understand personality development theories and strategies
- Evaluate one's personality and inculcate traits of an assertive personality
- Develop an assertive personality
- Develop life skills and required management traits
- Enhance contributory personality for academic and career success

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Concept of Personality	06
2.	Soft Skills and Personality Development	08
3.	Developing Contributory Personality	06
4.	Life skills and Personality Development	06
5.	Contemporary Issues in CPD	04

Total hours (Theory): --

Total hours (Practical): 30

Total hours: 30

Detailed Syllabus:

Sr. No.	Unit	Hours	% Weightage
1.	Concept of Personality	06	20%
	Meaning of personality, types of personality, factors contributing to personality, personality traits, personality profiling	Hours	

2.	Soft Skills and Personality Development	08 Hours	26%
	Positive thinking and mind set, leadership, assertiveness and negotiation skills, self-management, interpersonal skills, being a team player		
3.	Developing Contributory Personality	06 Hours	20%
	Concept of contributory personality, characteristics of a contributor, the contributor's vision of success and career, the scope of contribution in a field, embarking on the journey to contributor ship, developing contributor personality, reviewing some contributor's personalities		
4.	Life skills and Personality Development	06 Hours	20%
	Concept of life skills, self-awareness, empathy, decision making, problem solving		
5.	Contemporary Issues in CPD	04 Hours	14%
	Contemporary trends and practices in contributory personality development, case study and presentations		

Course Outcome (COs):

At the end of the course, the students will be able to

CO1	identify one's individual personality strengths and challenges
CO2	develop more assertive and optimist attitude towards work and life
CO3	develop quintessential soft skills to groom one's personality
CO4	identify traits of contributor personality
CO5	contribute to self, society, nation, and globe
CO6	develop skills of global citizenship to perform societal responsibilities

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	2	-	-	-	-	-
CO2	-	-	-	-	-	2	-	2			
CO3	-	-	-	-	-	2	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	3

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation, put “-”

Recommended Study Material:

❖ **Text book:**

1. Personality Development & Soft Skills, Oxford University Press
2. Soft Skills, Bookboon
3. Personality Development, Swami Vivekananda; Advaita Ashrama

❖ **Reference book:**

1. Contributor Personality Program Workbook (Volume 1,2),
2. Contributor Personality Program ActivGuide, Illumine Knowledge Pvt. Ltd

❖ **Web material:**

1. <https://www.coursera.org/learn/wharton-success>
2. <https://www.coursera.org/learn/personality-types-at-work>
3. <https://www.coursera.org/learn/self-awareness>

FACULTY OF PHARMACY

Bachelor of Pharmacy Programme

SYLLABI

(Semester – VII)

CHAROTAR UNIVERSITY OF SCIENCE

AND TECHNOLOGY

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH7001: MEDICINAL CHEMISTRY-III (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Antibiotics Anti-tubercular Agents	12
2	Antimalarials	10
	Sulphonamides and Sulfones	
	Urinary Tract Anti-infective Agents	
3	Anti-tubercular agent	8
	Anti-leprosy Agents	
	Anti-viral Agents	
4	Anti-fungal Agents	7
	Anti-protozoal Agents	
	Anthelmintics	
5	Introduction to Drug Design	8
	Combinatorial Chemistry	
	Prodrugs	

Detailed Syllabus:

Course Content: Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (*)

Sr. No.	UNIT	Hours	Weightage (%)
1.	Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. β-Lactam antibiotics: Penicillin, cephalosporins, β-lactamase inhibitors, monobactams. Aminoglycosides: Streptomycin, neomycin, kanamycin.	12 Hours	26.66%

	Tetracyclines: Tetracycline, oxytetracycline, chlortetracycline, minocycline, doxycycline. Macrolide: Erythromycin, clarithromycin, azithromycin. Peptide Antibiotics: Polymyxin, bacitracin, gramicidin. Oxazolidinones: linezolid. Miscellaneous: Chloramphenicol, clindamycin.		
2.	Antimalarials, Sulphonamides and Sulfones and Urinary tract anti-infective agents Antimalarials Etiology of malaria. Quinolines: SAR, quinine sulphate, chloroquine, amodiaquine, primaquine phosphate, pamaquine, quinacrine hydrochloride, mefloquine. Biguanides and dihydro triazines: Cycloguanil pamoate, proguanil. Miscellaneous: Pyrimethamine, artesunate, artemether, atovaquone. Sulphonamides and Sulfones Historical development, chemistry, classification and SAR. Sulfonamides: Sulphamethizole, sulfisoxazole, sulphamethizine, sulfacetamide, sulphapyridine, sulfamethoxazole, sulphadiazine, mefenide acetate, sulfasalazine. Folate reductase inhibitors: trimethoprim, cotrimoxazole. Sulfones: Dapsone. Urinary tract anti-infective agents Quinolones: SAR of quinolones, nalidixic acid, norfloxacin, enoxacin, ciprofloxacin, ofloxacin, lomefloxacin, sparfloxacin, gatifloxacin, moxifloxacin. Miscellaneous: Furazolidine, nitrofurantoin, methanamine.	10 Hours	22.22%
3.	Anti-tubercular Agents, Anti-Leprosy Agents and Antiviral agents Anti-tubercular Agents Synthetic anti tubercular agents: isoniazid, ethionamide, ethambutol, pyrazinamide, para-amino salicylic acid. Anti-tubercular antibiotics: rifampicin, rifabutin, cycloserine streptomycin, capreomycin sulphate. Anti-Leprosy Agents: dapson, clofazimine Antiviral agents Amantadine hydrochloride, rimantadine hydrochloride, idoxuridine trifluoride, acyclovir, gancyclovir, zidovudine, didanosine, zalcitabine, lamivudine, loviride, delavirdine, ribavirin, saquinavir, indinavir, ritonavir.	8 Hours	17.77%

4.	Antifungal agents, Anti-protozoal Agents and Anthelmintics	7 Hours	15.55%
	<p>Antifungal agents</p> <p>Antifungal antibiotics: amphotericin-B, nystatin, natamycin, griseofulvin. Synthetic antifungal agents: clotrimazole, econazole, butoconazole, oxiconazole tioconazole, miconazole, ketoconazole, terconazole, itraconazole, fluconazole, naftifine hydrochloride, tolnaftate.</p> <p>Anti-protozoal Agents</p> <p>Metronidazole, tinidazole, ornidazole, diloxanide, iodoquinol, pentamidine isethionate, atovaquone, eflornithine.</p> <p>Anthelmintics</p> <p>Diethylcarbamazine citrate, thiabendazole, mebendazole, albendazole, niclosamide, oxamniquine, praziquantal, ivermectin.</p>		
5.	<p>Introduction to Drug Design, Combinatorial Chemistry and Prodrugs</p> <p>Introduction to Drug Design: Various approaches used in drug design. Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Taft's steric parameter and Hansch analysis. Pharmacophore modeling and docking techniques.</p> <p>Combinatorial Chemistry: Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.</p> <p>Prodrugs: Basic concepts and application of prodrugs design</p>	8 Hours	17.77%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	summarize the physicochemical properties of drugs, structure activity relationship (SAR) and computational technique in relation to drug design and discovery
CO2	describe the chemistry and structure activity relationship of drugs with respect to their pharmacological activity
CO3	illustrate the drug metabolic pathways and its impact on adverse effect and therapeutic effect of drugs
CO4	suggest, categorise and outline the chemical synthetic pathways of selected drugs

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	3	-	-	-	-	-	-	-	2
CO2	2	-	2	-	-	-	-	-	-	-	2
CO3	2	-	2	-	-	-	-	-	-	-	-
CO4	2	-	2	-	-	-	-	-	-	-	3

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH7001P: MEDICINAL CHEMISTRY-III (Practical)

Total hours: 60 Hr

Outline of the course:

Sr. No.	List of Practicals
1	Preparation of drugs and intermediates <ul style="list-style-type: none"> • Sulphanilamide • 7-Hydroxy, 4-methyl coumarin • Chlorobutanol • Triphenyl imidazole • Tolbutamide • Hexamine
2	Assay of drugs <ul style="list-style-type: none"> • Isonicotinic acid hydrazide • Chloroquine • Metronidazole • Dapsone • Chlorpheniramine maleate • Benzyl penicillin
3	Preparation of medicinally important compounds or intermediates by microwave irradiation technique
4	Drawing structures and reactions using chem draw®
5	Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinski's Rule of Five)

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	synthesize the intermediates and drugs through conventional and microwave techniques
CO2	perform assay of drugs and intermediates using appropriate analytical methods
CO3	determine various physicochemical properties of the drugs by drug design software
CO4	carry out necessary calculations, prepare the report and justify the approach

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	3	3	-	-	-	-	3	-	-	-
CO2	2	3	3	3	-	-	-	3	-	-	-
CO3	2	3	3	3	-	-	-	3	-	-	-
CO4	-	-	2	-	-	-	-	3	-	-	-

Recommended Study Material:**❖ Textbook:**

1. Wilson and Griswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol. I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Graham L. Petrick's An introduction to Medicinal Chemistry
8. D. Sriram and P. Yogeshwari's Medicinal Chemistry
9. Camile G. Wermuth's The Practice of Medicinal Chemistry
10. Kadam, Mahadik and Bothra's Principle of Medicinal Chemistry (Vol I and II)

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH7002: QUALITY ASSURANCE (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Quality Assurance and Quality Management concepts Total Quality Management (TQM) ICH Guidelines Quality by Design (QbD) ISO 9000 & ISO14000 NABL accreditation	10
2	Organization and personnel Premises Equipments and Raw Materials	10
3	Quality Control Good Laboratory Practices	10
4	Complaints Document Maintenance in Pharmaceutical Industry	8
5	Calibration and Validation Warehousing	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Quality Assurance and Quality Management Concepts, Total Quality Management (TQM), ICH Guidelines, Quality by design (QbD), ISO 9000 and ISO14000 and NABL accreditation	10 Hours	22.22%

	Quality assurance and quality management concepts: definition and concept of quality control, quality assurance and GMP. Total Quality Management (TQM): definition, elements, philosophies. ICH Guidelines: purpose, participants, process of harmonization, brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines. Quality by design (QbD): Definition, overview, elements of QbD program, tools.		
	ISO 9000 & ISO14000: overview, benefits, elements, steps for registration. NABL accreditation: Principles and procedures.		
2.	Organization and Personnel, Premises and Equipment's and Raw Materials Organization and personnel: personnel responsibilities, training, hygiene and personal records. Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination. Equipment's and raw materials: equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.	10 Hours	22.22%
3.	Quality Control and Good Laboratory Practices Control: quality control test for containers, rubber closures and secondary packing materials. Good laboratory practices: general provisions, organization and personnel, facilities, equipment, testing facilities operation, test and control articles, protocol for conduct of a nonclinical laboratory study, records and reports, disqualification of testing facilities.	10 Hours	22.22%
4.	Complaints and Document Maintenance in Pharmaceutical Industry Complaints: complaints and evaluation of complaints, handling of return good, recalling and waste disposal. Document maintenance in pharmaceutical industry: batch formula record, master formula record, SOP, quality audit, quality review and quality documentation, reports and documents, distribution records.	8 Hours	17.77%

5.	Calibration and Validation and Warehousing Calibration and validation: introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, qualification of UV-Visible spectrophotometer. General principles of analytical method validation. Warehousing: good warehousing practice, materials management	7 Hours	15.55%
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Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe the concept, philosophy and elements of quality control, quality assurance, and quality management system
CO2	summarize the importance of principles of Good Manufacturing Practices and scope of quality certifications in a pharmaceutical industry
CO3	write the concept of good laboratory practices in pharmaceutical industry
CO4	write the purpose and processes of the international council for harmonisation of technical requirements for pharmaceuticals
CO5	describe the process of calibration, validation, and documentation

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	3	-	-	-	-	-	-	-	3
CO2	2	-	2	-	-	-	-	-	-	-	3
CO3	2	-	2	-	-	-	-	-	-	-	3
CO4	2	-	-	-	-	-	-	-	-	-	3
CO5	2	-	3	-	-	-	-	-	-	-	3

Recommended Study Material:

❖ Textbook:

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2 nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Deckker Series 9. ICH guidelines, ISO 9000 and 14000 guidelines

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH7003: BIOPHARMACEUTICS AND PHARMACOKINETICS (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction to Biopharmaceutics	10
2	Elimination	10
	Bioavailability and Bioequivalence	
3	Pharmacokinetics	10
4	Multicompartment Models	8
5	Nonlinear Pharmacokinetics	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Introduction to Biopharmaceutics Absorption: Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from non per oral extra-vascular routes. Distribution: Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding, kinetics of protein binding, clinical significance of protein binding of drugs.	10 Hours	22.22%
2.	Elimination and Bioavailability and Bioequivalence Elimination: Drug metabolism and basic understanding metabolic pathways, renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, non renal routes of drug excretion Bioavailability and Bioequivalence: Definition and objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, <i>in vitro</i> drug dissolution models, <i>in vitro-in vivo</i> correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.	10 Hours	22.22%
3.	Pharmacokinetics	10	22.22%

	Definition and introduction to pharmacokinetics, compartment models, non compartment models,	Hours	
	physiological models, one compartment open model. (a). intravenous injection (bolus) (b). intravenous infusion and (c) extra vascular administrations. Pharmacokinetics parameters - KE, $t_{1/2}$, V_d , AUC, Ka, Clt and CLR – definitions, methods of eliminations, understanding of their significance and application.		
4.	Multicompartment Model Two compartment open model. IV bolus, kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical settings.	8 Hours	17.77%
5.	Nonlinear Pharmacokinetics Introduction, factors causing non-linearity, Michaelis-Menton method of estimating parameters, explanation with example of drugs.	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe the ADME of drug
CO2	narrate the concepts of bioavailability and bioequivalence of drug products
CO3	describe pharmacokinetics parameters and differentiate various pharmacokinetic models
CO4	describe the nonlinear pharmacokinetics and its application with example

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	-	-	-	-	-	-	3
CO2	3	-	2	-	-	-	-	-	-	-	3
CO3	3	-	3	-	-	-	-	-	-	-	-
CO4	3	-	3	-	-	-	-	-	-	-	-

Recommended Study Material:

❖ Textbook:

1. Biopharmaceutics and Clinical Pharmacokinetics, Milo Gibaldi, Lea and Febriger, Pennsylvania, USA.
2. Biopharmaceutics and Pharmacokinetics: An introduction, Robert E Notari, Marcel Dekker Inc.
3. Applied biopharmaceutics and pharmacokinetics International edition, Leon Shargel and Andrew B. C. YU, The McGraw-Hill Companies Inc. USA
4. Biopharmaceutics and Pharmacokinetics-A Treatise, D. M. Brahmankar and Sunil

- B. Jaiswal, Vallabh Prakashan, New Delhi
5. Pharmacokinetics, Milo Gibaldi, Donald R., Marcel Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics, James Swarbrick, Lea & Febiger, Philadelphia, USA
8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozen, Lea and Febiger, Philadelphia, 1995.
9. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
10. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded, Reboot E Notari Marcel Dekker Inc, New York and Basel, 1987.
11. Remington's Pharmaceutical Sciences, Mack Publishing Company Pennsylvania

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH7004: PHARMACY PRACTICE (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Hospital and it's organization	10
	Hospital pharmacy and its organization	
	Adverse drug reaction	
	Community pharmacy	
2	Drug distribution system in a hospital	10
	Hospital formulary	
	Therapeutic drug monitoring	
	Medication adherence	
	Patient medication history interview	
	Community pharmacy management	
3	Pharmacy and therapeutic committee	10
	Drug information services	
	Patient counseling	
	Education and training program in the hospital	
	Prescribed medication order and communication skills	
4	Budget preparation and implementation	8
	Clinical pharmacy	
	Over the counter (OTC) sales	
5	Drug store management and inventory control	7
	Investigational use of drugs	
	Interpretation of clinical laboratory tests	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1	Hospital and it's Organization, Hospital Pharmacy and its Organization, Adverse Drug Reaction, and Community Pharmacy	10 Hours	22.22%
	Hospital and it's organization: Definition, classification of hospital- primary, secondary and tertiary hospitals, classification based on clinical and non- clinical basis, organization structure of a hospital, and medical staffs involved in the hospital and their function.		

	Hospital pharmacy and its organization: Definition, functions of hospital pharmacy, organization structure, location, layout and staff requirements, and responsibilities and functions of hospital pharmacist. Adverse drug reaction: Classifications - excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs. Drug interaction- beneficial interactions, adverse interactions and pharmacokinetic drug interactions, methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management. Community Pharmacy: Organization and structure of retail and wholesale drug store, types and design, legal requirements for establishment and maintenance of a drug store, dispensing of proprietary products, maintenance of records of retail and wholesale drug store.		
2	Drug Distribution System in a Hospital, Hospital Formulary, Therapeutic Drug Monitoring, Medication Adherence, Patient Medication History Interview, and Community Pharmacy Management Drug distribution system in a hospital: Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labeling, dispensing of drugs to ambulatory patients, and dispensing of controlled drugs. Hospital formulary: Definition, contents of hospital formulary, differentiation of hospital formulary and drug list, preparation and revision, and addition and deletion of drug from hospital formulary. Therapeutic drug monitoring: Need for therapeutic drug monitoring, Factors to be considered during the therapeutic drug monitoring, and Indian scenario for therapeutic drug monitoring. Medication adherence: Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence. Patient medication history interview: Need for the patient medication history interview, medication interview forms. Community pharmacy management: Financial, materials, staff, and infrastructure requirements	10 Hours	22.22%
3	Pharmacy and Therapeutic Committee, Drug Information Services, Patient Counseling, Education and Training	10 Hours	22.22%

	Program in the Hospital, Education and Training Program in the Hospital, and Prescribed Medication Order and Communication Skills Pharmacy and therapeutic committee: Organization, functions, policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation. Drug information services: Drug and poison information centre, sources of drug information, computerised services, and storage and retrieval of information. Patient counseling: Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist Education and training program in the hospital: Role of pharmacist in the education and training program, Internal and external training program, services to the nursing homes/clinics, code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education. Prescribed medication order and communication skills: Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.		
4	Budget Preparation and Implementation, Clinical Pharmacy, and Over the Counter (OTC) Sales Budget preparation and implementation: Budget preparation and implementation Clinical Pharmacy: Introduction to clinical pharmacy, concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, ward round participation, medication history and pharmaceutical care. Over the counter (OTC) sales: Introduction and sale of over the counter and rational use of common over the counter medications.	8 Hours	17.77%
5	Drug Store Management and Inventory Control, Investigational Use of Drugs and Interpretation of Clinical Laboratory Tests	7 Hours	15.55%

	Drug store management and inventory control: Organization of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, reorder quantity level, and methods used for the analysis of the drug expenditure Investigational use of drugs: Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee. Interpretation of Clinical Laboratory Tests: Blood chemistry, hematology, and urinalysis	
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Course Outcome (COs):

At the end of the course, the students would be able to

CO1	identify various drug distribution methods in a hospital, drug related problems, pharmacy stores management
CO2	describe the rational use of drug therapy
CO3	interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
CO4	review the medication chart and correlate with observed clinical state
CO5	describe the components of patient counseling

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	-	-	-	-	-	-	-	3
CO2	3	-	3	-	-	-	-	-	-	-	3
CO3	3	-	3	-	-	-	-	-	-	-	3
CO4	3	-	3	-	-	-	2	2	2	-	3
CO5	3	-	3	-	-	-	2	-	2	-	-

Recommended Study Material:

❖ Textbook:

1. Merchant S.H. and Dr. J.S. Quadry. A textbook of hospital pharmacy, 4th ed. Ahmadabad: B.S. Shah Prakashan; 2001.
2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. A textbook of Clinical Pharmacy Practice- essential concepts and skills, 1st ed. Chennai: Orient Longman Private Limited; 2004.
3. William E. Hassan. Hospital pharmacy, 5th ed. Philadelphia: Lea & Febiger; 1986.
4. Tipnis Bajaj. Hospital Pharmacy, 1st ed. Maharashtra: Career Publications; 2008.
5. Scott LT. Basic skills in interpreting laboratory data, 4th ed. American Society of Health System Pharmacists Inc; 2009.
6. Parmar N.S. Health Education and Community Pharmacy, 18th ed. India: CBS

Publishers & Distributors; 2008.

❖ **Journals:**

1. Therapeutic drug monitoring. ISSN: 0163-4356
2. Journal of pharmacy practice. ISSN : 0974-8326
3. American journal of health system pharmacy. ISSN: 1535-2900 (online)
4. Pharmacy times (Monthly magazine)

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH7005: NOVEL DRUG DELIVERY SYSTEM (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Controlled drug delivery systems	10
	Polymers	
2	Microencapsulation	10
	Mucosal Drug Delivery system	
	Implantable Drug Delivery Systems	
3	Transdermal Drug Delivery Systems	10
	Gastroretentive Drug Delivery Systems	
	Nasopulmonary Drug Delivery System	
4	Targeted drug Delivery	8
5	Ocular Drug Delivery Systems	7
	Intrauterine Drug Delivery Systems	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Controlled drug delivery systems and Polymers Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design-controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.	10 Hours	22.22%
2.	Microencapsulation, Mucosal Drug Delivery System, and Implantable Drug Delivery Systems	10 Hours	22.22%

	Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications Mucosal Drug Delivery system: Introduction, principles of bioadhesion/mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implants and osmotic pump.		
3.	Transdermal Drug Delivery Systems, Gastroretentive drug delivery systems, and Nasopulmonary Drug Delivery System	10 Hours	22.22%
	Transdermal Drug Delivery Systems: Introduction, permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches Gastroretentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS - Floating, high-density systems, inflatable and gastroadhesive systems and their applications Nasopulmonary drug delivery system: Introduction to nasal and pulmonary routes of drug delivery, formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers.		
4.	Targeted drug Delivery	8 Hours	17.77%
	Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications		
5.	Ocular Drug Delivery Systems and Intrauterine Drug Delivery Systems	7 Hours	15.55%
	Ocular Drug Delivery Systems: Introduction, intraocular barriers and methods to overcome - preliminary study, ocular formulations and ocuserts Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications		

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe fundamentals, preparation and evaluation of controlled and targeted drug delivery systems
CO2	describe and evaluate various novel drug delivery systems
CO3	narrate fundamentals and methods of preparation, evaluation of mucosal, implantable drug delivery systems and microemulsion.
CO4	describe and evaluate ocular drug delivery system
CO5	narrate fundamentals and methods of preparation, evaluation of transdermal, gastro-retentive and naso-pulmonary drug delivery system

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	-	-	-	-	-	-	3
CO2	3	-	3	-	-	-	-	-	-	-	3
CO3	3	-	3	-	-	-	-	-	-	-	3
CO4	3	-	3	-	-	-	-	-	-	-	3
CO5	3	-	3	-	-	-	-	-	-	-	3

Recommended Study Material:

❖ Textbook:

1. Novel Drug Delivery Systems, Y W. Chien, Marcel Dekker, Inc., New York.
2. Controlled Drug Delivery Systems, Robinson, J. R., Lee V. H. L, Marcel Dekker, Inc., New York.
3. Encyclopedia of Controlled Delivery, Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York.
4. Controlled and Novel Drug Delivery, N.K. Jain, CBS Publishers & Distributors, New Delhi.
5. Controlled Drug Delivery - Concepts and Advances, S.P. Vyas and R.K. Khar, Vallabh Prakashan, New Delhi.

❖ Journals

1. Indian Journal of Pharmaceutical Sciences (IPA)
2. Indian Drugs (IDMA)
3. Journal of Controlled Release (Elsevier Sciences)
4. Drug Development and Industrial Pharmacy (Marcel & Decker)
5. International Journal of Pharmaceutics (Elsevier Sciences)

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH7006: PRACTICE SCHOOL

Total hours: 180

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours	Percentage
1	Practice School	12 per week	100%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	determine novel transdermal, gastroprotective and nasopulmonary drug delivery system and microemulsion in the related research field.
CO2	monitor medication chart review as well as clinical review and do patient counselling.
CO3	perform assay of drugs and intermediates using appropriate analytical methods
CO4	describe methods for preparation and suggest the approach to standardize herbal drugs, herbal formulation and ayurveda formulations.
CO5	quantify drugs using various <i>in vivo</i> and <i>in vitro</i> experiments

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	-	-	-	-	-	-	3
CO2	3	-	3	-	-	-	-	-	-	-	3
CO3	3	3	3	3	-	-	-	3	-	-	-
CO4	3	-	-	3	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	3

Recommended Study Material:

❖ **Reference books:**

1. Anjaneyulu, Y., & Marayya, R. (2005). Quality Assurance and Quality Management in Pharmaceutical Industry: Book Syndicate
2. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy).
3. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
4. Drug discovery and Evaluation by Vogel H.G.
5. Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard

6. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. A textbook of Clinical Pharmacy Practice- essential concepts and skills, 1st ed. Chennai: Orient Longman Private Limited; 2004.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH7007: ENTREPRENEURSHIP FOR PHARMA PROFESSIONALS (Theory)

Total hours: 15 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Entrepreneur-Entrepreneurship-Enterprise-Intrapreneurship	3
2	Start-Up process	3
3	Entrepreneurial Challenges in Small Business	4
4	Governments Role in Growth of MSMEs and SMEs	3
5	Case Studies on Successful and Unsuccessful Entrepreneurs and Ventures	2

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Entrepreneur-Entrepreneurship-Enterprise-Intrapreneurship <ul style="list-style-type: none"> • Conceptual issues. • Nature and Characteristics of Entrepreneurship • Factors affecting entrepreneurship • Entrepreneurship and economic development • Barriers to entrepreneurship • Entrepreneurial competencies. • Entrepreneurial process. • Entrepreneurship vs. Management. • Scope and Need of NGO's in Pharmaceuticals • Growth drivers in Indian Pharmaceutical Industry • Import and Export in Pharma Industry • Business ethics related to pharmaceutical industry 	3 Hours	20 %
2.	Start-Up process <ul style="list-style-type: none"> • Role of creativity and innovation and business research. • Sources of business ideas • Small business as the seedbed of entrepreneurship. 	3 Hours	20 %

	<ul style="list-style-type: none"> • Entrepreneurial motivation, performance and rewards. • Functions of entrepreneurs • The process of setting up a small business. (Legitimate compliances) • Business Plan- contents, importance, pre-requisites for an effective business plan. • Basic of market research, Introduction, different method of research, target group, etc. • Company Start up either Pharma marketing or Manufacturing • Current Government policies for Start-Up • Government support for new start-Up initiation 		
3.	Entrepreneurial Challenges in small business	4 Hours	26.66%
	<ul style="list-style-type: none"> • Sources of venture capital, fixed capital, working capital and a basic awareness of financial services such as venture capital, private equity, leasing and factoring • The concept and application of product life cycle, advertising & publicity, sales & distribution management. • HR challenges- Availability of talent, retention, compensation, etc. • Legal and Government Challenges. • Licensing Process in Pharma Manufacturing and Marketing 		
4.	Governments Role in Growth of MSMEs & SMEs	3 Hours	20 %
	<ul style="list-style-type: none"> • Government policies • Supporting system to promotes Micro, Small and Medium enterprise • Schemes from Central Governments and State Governments 		
5.	Case Studies on Successful and Unsuccessful Entrepreneurs and Ventures	2 Hours	13.33%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe the basic concepts in the area of entrepreneurship, the role and importance of entrepreneurship for economic development
CO2	identify and describe the elements of successful start-ups

CO3	summarize the challenges for starting a business venture
CO4	Interpret their own business plan

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	-	2	-	-	-	-	-	-	-	3
CO2	1	3	2	-	3	3	-	-	-	-	3
CO3	1	3	2	-	3	3	-	-	-	-	3
CO4	1	3	-	-	-	3	-	-	-	-	3

Recommended Study Material:

❖ **Textbook:**

1. Brandt, Steven C., The 10 Commandments for Building a Growth Company, Third Edition, Macmillan Business Books, Delhi, 1977.
2. Dollinger, Mare J., Entrepreneurship: Strategies and Resources, Illinois, Irwin, 1955.
3. Entrepreneurial Business Law Journal
4. Entrepreneurship Theory and Practice
5. Holt, David H., Entrepreneurship: New Venture Creation, Prentice-Hall of India, latest Edition.
6. Kazmi, Azhar, —What Young Entrepreneurs Think and Do: A Study of Second Generation Business Entrepreneurs, || The Journal of Entrepreneurship, 8, No. 1, 1999, pp. 67-78.
7. Small Business Economics
8. Vesper, KarlsH, New Venture Strategies, (Revised Edition), New Jersey, Prentice-Hall, 1990

❖ **Journals:**

1. Journal of Business Venturing
2. Journal of Developmental Entrepreneurship
3. Journal of International Entrepreneurship
4. Journal of Small Business Management
5. Journal: Entrepreneurship and Regional Development

❖ **Website:**

1. <http://msmestartupkit.com>
2. <http://www.dcmsme.gov.in>

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH7007P: ENTREPRENEURSHIP FOR PHARMA PROFESSIONALS (Project)

Total hours: 30

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours/weeks	Percentage
1	Entrepreneurship for Pharma Professionals (Project)	2	100%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe the basic concepts in the area of entrepreneurship, the role and importance of entrepreneurship for economic development
CO2	identify and describe the elements of successful start-ups
CO3	summarize the challenges for starting a business venture
CO4	Interpret their own business plan

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	-	2	-	-	-	-	-	-	-	3
CO2	1	3	2	-	3	3	-	-	-	-	3
CO3	1	3	2	-	3	3	-	-	-	-	3
CO4	1	3	-	-	-	3	-	-	-	-	3

FACULTY OF PHARMACY

Bachelor of Pharmacy Programme

SYLLABI

(Semester – VIII)

**CHAROTAR UNIVERSITY OF SCIENCE
AND TECHNOLOGY**

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH8001: BIOSTATISTICS AND RESEARCH METHODOLOGY (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the Unit	Minimum number of hours
1	Introduction	10
	Measures of central tendency	
	Measures of dispersion	
	Correlation	
2	Regression	10
	Probability	
	Parametric test	
3	Non-parametric tests	10
	Introduction to Research	
	Designing the methodology	
	Graphs	
4	Regression modeling	8
	Clinical trials problems	
5	Design and analysis of experiments	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Introduction, Measures of Central Tendency, Measures of Dispersion and Correlation Introduction: Statistics, biostatistics, frequency distribution, measures of central tendency: mean, median, mode-pharmaceutical examples Measures of dispersion: Dispersion, range, standard deviation, pharmaceutical problems Correlation: Definition, Karl Pearson's coefficient of correlation, multiple correlation - pharmaceuticals examples	10 Hours	22.22%
2.	Regression, Probability and Parametric test Regression: Curve fitting by the method of least squares, fitting the lines $y = a + bx$ and $x = a + by$, multiple regression, standard error of regression- pharmaceutical examples	10 Hours	22.22%

	Probability: Definition of probability, binomial distribution, normal distribution, Poisson's distribution, properties – problem, sample, population, large sample, small sample, null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, error-I type, error-II type, Standard error of mean (SEM) - pharmaceutical examples Parametric test: t-test (sample, pooled or unpaired and paired), ANOVA, (one way and two way), least significance difference.		
3.	Non-Parametric tests, Introduction to Research, Graphs and Designing the Methodology Non-Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test Introduction to Research: Need for research, need for design of experiments, experiential design technique, plagiarism Graphs: Histogram, pie chart, cubic graph, response surface plot, counter plot graph Designing the methodology: Sample size determination and power of a study, report writing and presentation of data, protocol, cohorts studies, observational studies, experimental studies, designing clinical trial, various phases.	10 Hours	22.22%
4.	Regression Modeling and Clinical Trials Problems Blocking and confounding system for two-level factorials Regression modeling: Hypothesis testing in simple and multiple regression models. Introduction to practical components of industrial and clinical trials problems. Statistical analysis using Excel, SPSS, MINITAB®, Design of experiments, R - Online statistical Software's to industrial and clinical trial approach	8 Hours	17.77%
5.	Design and Analysis of experiments Factorial Design: Definition, design. Advantage of factorial design Response surface methodology: Central composite design, historical design, optimization techniques	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	apply the basics of statistics in calculation of pharmaceutical problem
CO2	apply the concept of regression, probability and parametric tests to solve pharmaceutical problems
CO3	describe the operation of M.S. Excel, SPSS, R and MINITAB, DoE (design of experiment)
CO4	use the concept of design of experiment and perform optimization
CO5	interpret various statistical calculations using various statistical tools

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	3	-	-	-	-	-	-	-	3
CO2	2	-	3	-	-	-	-	-	-	-	3
CO3	2	-	3	-	-	-	-	-	-	-	-
CO4	2	-	3	-	-	-	-	-	-	-	3
CO5	2	-	3	-	-	-	-	-	-	-	3

Recommended Study Material:

❖ Textbook:

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork.
2. Fundamental of Statistics – Himalaya Publishing House- S.C.Gupta
3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,
4. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH8002: SOCIAL AND PREVENTIVE PHARMACY (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Concept of health and disease	10
	Social and health education	
	Sociology and health	
	Hygiene and health	
2	Preventive medicine	10
3	National health programs, its objectives, functioning and outcome	10
4	National health intervention programme	8
5	Community services in rural, urban and school health	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Concept of Health and Disease, Social and Health Education, Sociology and Health, Hygiene and Health	10 Hours	22.22%
	Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick. Social and health education: Food in relation to nutrition and health, balanced diet, nutritional deficiencies, vitamin deficiencies, malnutrition and its prevention. Sociology and health: Socio cultural factors related to health and disease, impact of urbanization on health and disease, poverty and health.		
	Hygiene and health: personal hygiene and health care; avoidable habits		
2.	Preventive Medicine	10	22.22%

	Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse	Hours	
3.	National Health Programs, its Objectives, Functioning and Outcome of the Following	10 Hours	22.22%
	National health programs, its objectives, functioning and outcome of the following: HIV AND AIDS control programme, TB, integrated disease surveillance program (IDSP), national leprosy control programme, national mental health program, national programme for prevention and control of deafness, universal immunization programme, national programme for control of blindness, pulse polio programme.		
4.	National health intervention programme National health intervention programme for mother and child, national family welfare programme, national tobacco control programme, national malaria prevention program, national programme for the health care for the elderly, social health programme; role of who in indian	8 Hours	17.77%
5.	Community services Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	narrate the concept of health and hygiene, disease and importance of health education
CO2	describe basic principles of preventive medicine and control of diseases
CO3	summarize the national health programme and national health intervention programme
CO4	justify the role of community services in social and preventive medicine

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	3	-	3
CO2	3	-	-	-	-	-	-	-	-	-	3
CO3	3	-	-	-	-	-	-	-	3	-	3
CO4	3	-	-	-	-	-	-	3	3	-	3

Recommended Study Material:**❖ Textbook:**

1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications
4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications
5. Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.
6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

❖ Journals:

1. Research in Social and Administrative Pharmacy
2. Elsevier
3. Ireland

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH8003: PHARMA MARKETING MANAGEMENT (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Marketing	10
	Pharmaceutical market	
2	Product decision	10
3	Promotion	10
4	Pharmaceutical marketing channels	08
	Professional sales representative (PSR)	
5	Pricing	07
	Emerging concepts in marketing	

Detailed Syllabus:

Sr. No .	UNIT	Hours	Weightage (%)
1.	Marketing and Pharmaceutical Market Marketing: Definition, general concepts and scope of marketing, distinction between marketing and selling, marketing environment, industry and competitive analysis, analyzing consumer buying behavior, industrial buying behavior. Pharmaceutical market: Quantitative and qualitative aspects, size and composition of the market, demographic descriptions and socio-psychological characteristics of the consumer, market segmentation and targeting. Consumer profile, motivation and prescribing habits of the physician, patients' choice of physician and retail pharmacist. Analyzing the Market, role of market research.	10 Hours	22.22%
2.	Product decision	10	22.22%

	Classification, product line and product mix decisions, product life cycle, product portfolio analysis, product positioning, new product decisions, product branding, packaging and labeling decisions, product management in pharmaceutical industry.	Hours	
3.	Promotion Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.	10 Hours	22.22%
4.	Pharmaceutical Marketing Channels and Professional Sales Representative (PSR) Pharmaceutical marketing channels: Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: strategic importance, tasks in physical distribution management. Professional sales representative (PSR): Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.	08 Hours	17.77%
5.	Design and Analysis of Experiments Pricing: Meaning, importance, objectives, determinants of price, pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority). Emerging concepts in marketing: Vertical and horizontal marketing, rural marketing, consumerism, industrial marketing, global marketing.	10 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to;

CO1	describe marketing concepts and consumer behaviour
CO2	describe about product life cycle and pharmaceutical product management
CO3	write various strategies for promotion of pharmaceutical products
CO4	explain various pricing strategies

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	-	3	-	3	3	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	3
CO3	3	3		-	3	-	-	3	-	-	3
CO4	3	3		-	-	-	-	-	-	-	3

Recommended Study Material:**❖ Textbook:**

1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi
2. Walker, Boyd and Larreche: Marketing Strategy- Planning and Implementation, TataMC GrawHill, New Delhi.
3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill
4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India
5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)
6. Ramaswamy, U.S & Nanakamari, S: Marketing Managemnt: Global Perspective, Indian Context, Macmillan India, New Delhi.
7. Shanker, Ravi: Service Marketing, Excell Books, New Delhi
8. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel

❖ **Reference book:**

1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi
2. Walker, Boyd and Larreche: Marketing Strategy- Planning and Implementation, TataMC GrawHill, New Delhi

❖ **Web Materials:**

1. <http://www.pharmabiz.com/>
2. <http://www.expressbdp.com/pharma/>
3. <http://www.cafepharma.com/>
4. <https://www.fiercepharma.com/>
5. <http://www.pharmalive.com/>
6. www.americanpharmaceuticalreview.com/1448-News/
7. <https://www.pharma-iq.com/>
8. <https://www.pharmatutor.org/pharma-news>
9. <http://www.pharmatimes.com/news>
10. <https://www.worldpharmanews.com/>
11. <https://www.businessstoday.in/sectors/pharma>
12. www.reuters.com
13. <http://globalpharmaupdate.com/>
14. <http://newsblur.com/>
15. <https://www.pharmatching.com/inforena/>

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BP8004: PHARMACEUTICAL REGULATORY SCIENCE (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	New Drug Discovery and Development	10
2	Regulatory Approval Process	10
3	Registration of Indian Drug Product in Overseas Market	10
4	Clinical Trials	8
5	Regulatory Concepts	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	New Drug Discovery and Development Stages of drug discovery, drug development process, pre-clinical studies, non-clinical activities, clinical studies, innovator and generics, concept of generics, generic drug product development.	10 Hours	22.22%
2.	Regulatory Approval Process Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA) in US. Changes to an approved NDA/ANDA. Regulatory authorities and agencies. Overview of regulatory authorities of United States, European Union, Australia, Japan, Canada (organization structure and types of applications)	10 Hours	22.22%
3.	Registration of Indian Drug Product in Overseas Market Procedure for export of pharmaceutical products, technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD) research.	10 Hours	22.22%
4.	Clinical Trials Developing clinical trial protocols, Institutional Review Board/Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of investigators, sponsors and monitors, managing	8 Hours	17.77%

	and monitoring clinical trials. Pharmacovigilance - safety monitoring in clinical trials.		
5.	Regulatory Concepts Basic terminologies, guidance, guidelines, regulations, laws and acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
CO2	describe the process of drug discovery and development
CO3	describe the regulatory approval process and their registration in Indian and international markets
CO4	narrate various guidelines related clinical trial regulations, managing and monitoring
CO5	describe the various regulatory terminologies, guidance, guidelines, regulations, laws and acts related to pharmaceuticals

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	3
CO2	3	-	-	-	-	-	-	-	-	-	3
CO3	3	-	3	-	-	-	-	-	-	-	3
CO4	3	-	-	-	-	-	-	-	-	-	3
CO5	3	-	3	-	-	-	-	-	-	-	3

Recommended Study Material:

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185. Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus.
6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143

7. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance
By Fay A. Rozovsky and Rodney K. Adams
8. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene
9. Drugs: From Discovery to Approval, Second Edition By Rick Ng

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH8005: PHARMACOVIGILANCE (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction to pharmacovigilance	10
	Introduction to adverse drug reactions	
	Basic terminologies used in pharmacovigilance	
2	Drug and disease classification	10
	Drug dictionaries and coding in pharmacovigilance	
	Information resources in pharmacovigilance	
	Establishing pharmacovigilance programme	
3	Vaccine safety surveillance	10
	Pharmacovigilance methods	
	Communication in pharmacovigilance	
4	Statistical methods for evaluating medication safety data	8
	Safety data generation	
	ICH Guidelines for Pharmacovigilance	
5	Pharmacogenomics of adverse drug reactions	7
	Drug safety evaluation in special population	
	CIOMS	
	CDSCO (India) and pharmacovigilance	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Introduction to Pharmacovigilance, Introduction to Adverse Drug Reactions, Basic Terminologies used in Pharmacovigilance Introduction to pharmacovigilance: History and development of pharmacovigilance, importance of safety monitoring of medicine, WHO international drug monitoring programme, Pharmacovigilance Program of India (PvPI).	10 Hours	22.22%

	Introduction to adverse drug reactions: Definitions and classification of ADRs, detection and reporting, methods in causality assessment, severity and seriousness assessment, predictability and preventability assessment, management of adverse drug reactions. Basic terminologies used in pharmacovigilance: Terminologies of adverse medication related events, regulatory terminologies.		
2.	Drug and Disease Classification, Drug Dictionaries and Coding in Pharmacovigilance, Information Resources in Pharmacovigilance, Establishing Pharmacovigilance Programme Drug and disease classification, Anatomical, therapeutic and chemical classification of drugs, international classification of diseases, daily defined doses, international nonproprietary names for drugs. Drug dictionaries and coding in pharmacovigilance: WHO adverse reaction terminologies, meddra and standardised meddra queries, WHO drug dictionary, eudravigilance medicinal product dictionary. Information resources in pharmacovigilance: Basic drug information resources, specialized resources for ADRs Establishing pharmacovigilance programme: Establishing in a hospital, establishment and operation of drug safety department in industry, contract research organizations (CROs), establishing a national programme.	10 Hours	22.22%
3.	Vaccine Safety Surveillance, Pharmacovigilance Methods, Communication in Pharmacovigilance Vaccine safety surveillance: Vaccine pharmacovigilance, vaccination failure, adverse events following immunization. Pharmacovigilance methods: Passive surveillance – spontaneous reports and case series, stimulated reporting, active surveillance – sentinel sites, drug event monitoring and registries, comparative observational studies – cross sectional study, case control study and cohort study, targeted clinical investigations. Communication in pharmacovigilance: Effective communication in pharmacovigilance, communication in drug safety crisis management, communicating with regulatory agencies, business partners, healthcare facilities and media.	10 Hours	22.22%
4.	Statistical Methods for Evaluating Medication Safety Data Safety Data Generation, ICH Guidelines for Pharmacovigilance Statistical methods for evaluating medication safety data.	8 Hours	17.77%

	Safety data generation: Pre-clinical phase, clinical phase, post approval phase. ICH guidelines for pharmacovigilance: Organization and objectives of ICH, expedited reporting, individual case safety reports, periodic safety update reports, post approval expedited reporting, pharmacovigilance planning, good clinical practice in pharmacovigilance studies.		
5.	Pharmacogenomics of Adverse Drug Reactions, Drug Safety Evaluation in Special Population, CIOMS, CDSCO (India) and Pharmacovigilance Pharmacogenomics of adverse drug reactions. Drug safety evaluation in special population: Paediatrics, pregnancy and lactation, geriatrics. CIOMS: CIOMS working groups, CIOMS form. CDSCO (India) and Pharmacovigilance: D&C Act and Schedule Y, Differences in Indian and global pharmacovigilance requirements	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to;

CO1	describe concept of adverse drug reactions and relevant regulatory guidelines for pharmacovigilance
CO2	summarize the information resources, coding and establishment related to pharmacovigilance
CO3	describe and differentiate the methods of ADR reporting and vaccine surveillance
CO4	apply statistical methods for evaluation of medication safety data
CO5	narrate the concept of pharmacogenomics and drug safety evaluation in specialized populations

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	3
CO2	3	-	-	3	-	-	-	-	-	-	3
CO3	3	-	3	3	-	-	-	3	-	-	3
CO4	-	-	3	3	-	-	-	-	-	-	-
CO5	3	-	3	-	-	-	-	-	-	-	-

Recommended Study Material:

Text Books

1. Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, Medical Publishers.
2. Practical Drug Safety from A to Z by Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.
3. Mann's Pharmacovigilance: Elizabeth B. Andrews, Nicholas, Wiley Publishers.
4. Stephens' Detection of New Adverse Drug Reactions: John Talbot, Patrick Walle, Wiley Publishers.
5. An Introduction to Pharmacovigilance: Patrick Waller, Wiley Publishers.
6. Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert, Jones& Bartlett Publishers.
7. Textbook of Pharmacoepidemiolog edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Wiley Publishers.
8. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills: G. Parthasarathi, Karin NyfortHansen, Milap C. Nahata
9. National Formulary of India
10. Text Book of Medicine by Yashpal Munjal
11. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna

Web Links

12. <http://www.whoumc.org/DynPage.aspx?id=105825&mn1=7347&mn2=7259&mn3=72>
13. <http://www.ich.org/>
14. <http://www.cioms.ch/>
15. <http://cdsco.nic.in/>
16. http://www.who.int/vaccine_safety/en/
17. http://www.ipc.gov.in/PvPI/pv_home.html

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH8006: QUALITY CONTROL AND STANDARDIZATION OF HERBALS
(Theory)

Outline of the course: **Total hours: 45 Hr**

Sr. No.	Title of the unit	Minimum number of hours
1	Basic tests for drugs – pharmaceutical substances, medicinal plants materials and dosage forms	10
	WHO guidelines for quality control of herbal drugs	
	Evaluation of commercial crude drugs intended for use	
2	Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine	10
	WHO guidelines on current good manufacturing practices (cGMP) for herbal medicines	
	WHO guidelines on GACP for medicinal plants.	
3	EU and ICH guidelines for quality control of herbal drugs.	10
	Research guidelines for evaluating the safety and efficacy of herbal medicines	
4	Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products.	8
	Preparation of documents for new drug application and export registration	
	GMP requirements and Drugs and Cosmetics Act provisions.	
5	Regulatory requirements for herbal medicines	7
	WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems	
	Comparison of various herbal pharmacopoeias	
	Role of chemical and biological markers in standardization of herbal products	

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	UNIT-I Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms. WHO guidelines for quality control of herbal drugs. Evaluation of commercial crude drugs intended for use.	10 Hours	22.22%
2.	UNIT-II Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine. WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines. WHO Guidelines on GACP for Medicinal Plants.	10 Hours	22.22%
3.	UNIT-III EU and ICH guidelines for quality control of herbal drugs. Research guidelines for evaluating the safety and efficacy of herbal medicines	10 Hours	22.22%
4.	UNIT-IV Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products. Preparation of documents for new drug application and export registration. GMP requirements and Drugs and Cosmetics Act provisions.	8 Hours	17.77%
5.	UNIT-V Regulatory requirements for herbal medicines. WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems. Comparison of various herbal pharmacopoeias. Role of chemical and biological markers in standardization of herbal products	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe the parameters to be assessed as per WHO guidelines with rationale for quality control of herbal drugs
CO2	describe significance of GAP, GMP and GLP for assuring the quality of plant drugs
CO3	depict and describe the regulatory approval process and their registration in Indian and international markets
CO4	describe EU and ICH guidelines for quality control of herbal drugs
CO5	summarize the role of pharmacovigilance for utilization of medicinal plants

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	-	-	-	-	-	-	2
CO2	3	-	3	-	-	-	-	-	-	-	2
CO3	2	-	-	-	-	-	-	-	-	-	2
CO4	2	-	-	-	-	-	-	-	-	-	2
CO5	2	-	-	-	-	-	-	-	2	-	2

Recommended Study Material:

1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I , Carrier Pub., 2006.
4. Aggrawal, S.S., Herbal Drug Technology. Universities Press, 2002.
5. EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products,
6. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002
7. Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-8
8. WHO. Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998. WHO. Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998.
9. WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981.
10. WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.
11. WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005.
12. WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BP8007: COMPUTER AIDED DRUG DESIGN (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction to Drug Discovery and Development	10
	Lead discovery and Analog Based Drug Design	
2	Quantitative Structure Activity Relationship (QSAR)	10
3	Molecular Modeling and Virtual Screening Techniques Virtual Screening techniques	10
4	Informatics and Methods in Drug Design. Introduction to Bioinformatics, Chemo-informatics. ADME Databases, Chemical, Biochemical and Pharmaceutical Databases	8
5	Molecular Modeliling	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Introduction to Drug Discovery and Development, Lead Discovery and Analog Based Drug Design Introduction to Drug Discovery and Development: Stages of drug discovery and development. Lead discovery and Analog Based Drug Design: Rational approaches to lead discovery based on traditional medicine, random screening, non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation. Analog based drug design: bioisosterism, classification, bioisosteric replacement. Any three case studies.	10 Hours	22.22%
2.	Quantitative Structure Activity Relationship (QSAR) SAR versus QSAR, history and development of QSAR, types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent constant and Taft's steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.	10 Hours	22.22%
3.	Molecular Modeling and Virtual Screening Techniques Virtual Screening Techniques	10 Hours	22.22%

	Drug likeness screening, concept of pharmacophore mapping and pharmacophore based screening, molecular docking: rigid docking, flexible docking, manual docking, docking based screening. <i>De novo</i> drug design.		
4.	Informatics and Methods in Drug Design. Introduction to Bioinformatics, Chemo-informatics. ADME Databases, Chemical, Biochemical and Pharmaceutical Databases Informatics & Methods in drug design Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.	8 Hours	17.77%
5.	Molecular Modeling Introduction to molecular mechanics and quantum mechanics. Energy minimization methods and conformational analysis, global conformational minima determination.	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	summarize the process of discovering lead molecules
CO2	summarize and apply various informatics databases for drug discovery process
CO3	describe and apply the concepts of QSAR and docking
CO4	desribe various strategies to evolve drug like molecules.
CO5	apply use of molecular modeling softwares in drug discovery

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	3	-	-	-	-	-	-	3
CO2	2	-	-	3	-	-	-	-	-	-	3
CO3	2	-	3	3	-	-	-	-	-	-	2
CO4	2	-	3	3	-	-	-	-	-	-	2
CO5	2	-	3	3	-	-	-	-	-	-	2

Recommended Study Material:

1. Robert GCK, ed., —Drug Action at the Molecular Level|| University Prak Press Baltimore.
2. Martin YC. —Quantitative Drug Design|| Dekker, New York.
3. Delgado JN, Remers WA eds —Wilson & Gisvold's Text Book of Organic Medicinal & Pharmaceutical Chemistry|| Lippincott, New York.
4. Foye WO —Principles of Medicinal chemistry _Lea & Febiger.
5. Koro Ikovas A, Burckhalter JH. —Essentials of Medicinal Chemistry|| WileyInterscience.
6. Wolf ME, ed —The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry|| JohnWiley& Sons, New York.
7. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford UniversityPress.

8. Smith HJ, Williams H, eds, —Introduction to the principles of Drug Design|Wright Boston.
9. Silverman R.B. —The organic Chemistry of Drug Design and Drug Action|Academic Press New York. 172

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH8008: CELL AND MOLECULAR BIOLOGY (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Cell and Molecular Biology	10
2	Genetic Material of the Cell	10
3	Proteins and their Regulation	10
4	Cell Cycle and Science of Genetics	8
5	Cell Signalling	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Cell and Molecular Biology A. Cell and Molecular Biology: Definitions theory and basics and Applications. B. Cell and Molecular Biology: History and Summation. C. Theory of the Cell? Properties of cells and cell membrane. D. Prokaryotic versus Eukaryotic E. Cellular Reproduction F. Chemical Foundations – an Introduction and Reactions (Types)	10 Hours	22.22%
2.	Genetic material of the Cell A. DNA and the Flow of Molecular Structure B. DNA Functioning C. DNA and RNA D. Types of RNA E. Transcription and Translation	10 Hours	22.22%
3.	Proteins and its regulation A. Proteins: Defined and Amino Acids B. Protein Structure C. Regularities in Protein Pathways D. Cellular Processes E. Positive Control and significance of Protein Synthesis	10 Hours	22.22%
4.	Cell cycle and science of genetics	08	17.77%

	A. Science of Genetics B. Transgenics and Genomic Analysis C. Cell Cycle analysis	Hours	
	D. Mitosis and Meiosis E. Cellular Activities and Checkpoints		
5.	Cell signaling A. Cell Signals: Introduction B. Receptors for Cell Signals C. Signaling Pathways: Overview D. Misregulation of Signaling Pathways E. Protein-Kinases: Functioning	07 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	Summarize history and applications of cellular-molecular biology and genetics
CO2	describe cellular structure, functions, composition, reproduction and properties of cell membrane
CO3	corelate structure and functions of DNA, RNA and proteins
CO4	depict basic molecular genetic mechanisms
CO5	corelate cellular signaling pathways with cell physiology

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	3
CO2	3	-	-	-	-	-	-	-	-	-	3
CO3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	-	-	-	-	-	-	-	-	-	3
CO5	3	-	3	-	-	-	-	-	-	-	3

Recommended Study Material:

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Prokhorov, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. Edward: Fundamentals of Microbiology.
10. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi

11. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
12. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
13. RA Goldshy et. al., : Kuby Immunology

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH8009: COSMETIC SCIENCE (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Cosmetic excipients: skin, hair, oral cavity	10
2	Principles of formulation and building blocks of skin care products, Principles of formulation and building blocks of Hair care products, Principles of formulation and building blocks of oral care products.	10
3	Role of herbs in cosmetics: skin care, hair care, oral care, analytical cosmetics	10
4	Principles of cosmetic evaluation	8
5	Cosmetic problems associated with hair and scalp, with skin	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Cosmetic excipients: Skin, Hair, Oral Cavity Classification of cosmetic and cosmeceutical products. Cosmetic excipients: surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application. Skin: Basic structure and function of skin. Hair: Basic structure of hair. Hair growth cycle. Oral Cavity: Common problem associated with teeth and gum.	10 Hours	22.22%
2.	Principles of Formulation and Building Blocks of Skin Care Products Face wash, moisturizing cream, cold cream, vanishing cream their relative skin sensory, advantages and disadvantages. Application of these products in formulation of cosmeceuticals. Conditioning shampoo, hair conditioners, antidandruff shampoo. Hair oils. Chemistry and formulation of para-phylene diamine based hair dye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, mouthwash.	10 Hours	22.22%

3.	Role of herbs in cosmetics: skin care, hair care, oral care, analytical cosmetics Classification of Sunscreens and SPF. Role of herbs in cosmetics: Skin Care-Aloe and turmeric. Hair care-Henna and amla. Oral care-Neem and clove. Analytical cosmetics: BIS specification and analytical methods for shampoo, skincream and toothpaste.	10 Hours	22.22%
4.	Principles of Cosmetic Evaluation Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs. Principles of cosmetic evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, skin color, hair tensile strength, hair combing properties, soaps, and syndet bars. Evolution and skin benefits.	8 Hours	17.77%
5.	Cosmetic Problems Associated with Hair and Scalp, with Skin Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms comedogenic, dermatitis. Cosmetic problems associated with hair and scalp: dandruff, hair fall causes. Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and deodorants- Actives and mechanism of action.	7 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	classify cosmetics, cosmeceuticals and describe cosmetics excipients, structure and function of skin and hair along with problem associated with oral cavity
CO2	describe formulation and building blocks of skin care and hair care products
CO3	describe role of herbs in skin care, hair care and oral care
CO4	describe regulations for cosmetics and cosmeceuticals
CO5	describe problems associated with skin, hair and scalp

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	3
CO2	3	-	-	-	-	-	-	-	-	-	3
CO3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	-	-	-	-	-	-	-	-	-	3
CO5	3	-	-	-	-	-	-	-	-	-	3

Recommended Study Material:

1. Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
2. Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
3. Text book of cosmeticology by Sanju Nanda & Roop K. Khar, Tata Publishers.

176

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH8010: PHARMACOLOGICAL SCREENING METHODS (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Laboratory animals	08
2	Preclinical screening models	12
3	Preclinical screening models	10
4	Preclinical screening models	10
5	Research methodology and bio-statistics	05

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Laboratory Animals Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, techniques of blood collection and euthanasia.	08 Hours	17.77%
2.	Preclinical Screening Models- CNS Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study. Study of screening animal models for diuretics, nootropics, anti-Parkinson's, anti-asthmatics. Preclinical screening models for CNS activity- analgesic, antipyretic, anti inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, Alzheimer's disease.	12 Hours	26.66%
3.	Preclinical Screening Models- ANS Preclinical screening models for ANS activity- sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaesthetics.	10 Hours	22.22%

4.	Preclinical Screening Models- CVS		22.22%
	CVS activity: anti-hypertensives, diuretics, antiarrhythmic, anti-dyslipidemic activity, anti-platelet activity, coagulants, and anticoagulants. Preclinical screening models for other important drugs like antiulcer, anti-diabetic, anticancer and anti-asthmatics.	10 Hours	
5	Research Methodology and Bio-statistics Selection of research topic, review of literature, research hypothesis and study design. Pre-clinical data analysis and interpretation using Student's test and One-way ANOVA. Graphical representation of data	05 Hours	11.11%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe the utilization of laboratory animals and guidelines governing the utilization
CO2	describe and justify the screening models in preclinical research
CO3	use the fundamentals of research methodology and apply statistics for data analysis

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	3	-	-	-	3
CO2	3	-	-	-	-	-	-	-	-	-	3
CO3	3	-	3	3	-	-	-	-	-	-	3

Recommended Study Material:

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. CPCSEA guidelines for laboratory animal facility.
4. Drug discovery and Evaluation by Vogel H.G.
5. Drug Screening Methods by Suresh Kumar Gupta and S. K. Gupta
6. Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH8011: ADVANCED INSTRUMENTATION TECHNIQUES (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Nuclear Magnetic Resonance Spectroscopy	10
	Mass Spectrometry	
2	Thermal Methods of Analysis	10
	X-Ray Diffraction Methods	
3	Calibration and Validation	10
4	Radio Immune Assay	08
	Extraction Techniques	
5	Hyphenated Techniques	07

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Nuclear Magnetic Resonance Spectroscopy, Mass Spectrometry Nuclear Magnetic Resonance Spectroscopy: Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications. Mass Spectrometry: Principles, fragmentation, Ionization techniques – electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications.	10 Hours	22.22%
2.	Thermal Methods of Analysis, X-Ray Diffraction Methods Thermal Methods of Analysis: Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC) X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, X-ray Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications.	10 Hours	22.22%
3.	Calibration and Validation Calibration and validation: As per ICH and USFDA guidelines	10 Hours	22.22%

	Calibration of following Instruments: Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, fluorimeter, flame photometer, HPLC and GC.		
4.	Radio Immune Assay, Extraction Techniques Radio immune assay: Importance, various components, principle, different methods, limitation and applications of radio immuno assay. Extraction techniques: general principle and procedure involved in the solid phase extraction and liquid-liquid extraction.	08 Hours	17.77%
5	Hyphenated Techniques LC-MS/MS, GC-MS/MS, HPTLC-MS.	07 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	suggest and justify the applications of the advanced instruments in drug analysis
CO2	interpret the spectral and thermal data of compounds
CO3	describe the calibration of various analytical instruments
CO4	describe the applications of radioimmuno assay and appropriate extraction techniques in estimation of biomarkers

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	-	-	-	-	-	-	3
CO2	3	-	3	-	-	-	-	-	-	-	3
CO3	3	-	3	-	-	-	-	-	-	-	3
CO4	3	-	3	-	-	-	-	-	-	-	3

Recommended Study Material:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH8012: DIETARY SUPPLEMENTS AND NUTRACEUTICALS (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Definitions of functional foods, nutraceuticals and dietary supplements	07
2	Phytochemicals as nutraceuticals	15
3	Introduction to free radicals Dietary fibres and complex carbohydrates as functional food ingredients	07
4	Role of free radicals in various diseases and free radicals theory of ageing Antioxidants Functional foods for chronic disease prevention	10
5	Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals Regulatory aspects on food safety. Adulteration of foods Pharmacopoeial Specifications for dietary supplements and nutraceuticals	06

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Definitions of Functional Foods, Nutraceuticals and Dietary Supplements Definitions of Functional foods, nutraceuticals and dietary supplements. Classification of nutraceuticals, health problems and diseases that can be prevented or cured by nutraceuticals <i>i.e.</i> weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: spirulina, soyabean, ginseng, garlic, broccoli, gingko, flaxseeds	7 Hours	15.55%

2.	Phytochemicals as Nutraceuticals		33.33%
	<p>Phytochemicals as nutraceuticals: Occurrence and characteristic features (chemical nature medicinal benefits) of following</p> <p>Carotenoids- α and β-carotene, lycopene, xanthophylls, leutin sulfides: diallyl sulfides, allyl trisulfide.</p> <p>polyphenolics: resveretrol</p> <p>Flavonoids- rutin, naringin, quercitin, anthocyanidins, catechins, flavones</p> <p>Prebiotics/Probiotics.: fructo oligosaccharides, lacto bacillum</p> <p>Phyto estrogens: isoflavones, daidzein, geebustin, lignans</p> <p>Tocopherols</p> <p>Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, tea and the like.</p>	15 Hours	
3.	Introduction to Free Radicals, Dietary Fibres and Complex Carbohydrates as Functional Food Ingredients	7 Hours	15.55%
	<p>Introduction to free radicals: free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, carbohydrates, nucleic acids.</p> <p>Dietary fibres and complex carbohydrates as functional food ingredients.</p>		
4.	<p>Role of Free Radicals in Various Diseases and Free Radicals Theory of Ageing, Antioxidants, Functional Foods for Chronic Disease Prevention</p> <p>Free radicals in diabetes mellitus, inflammation, ischemic reperfusion injury, cancer, atherosclerosis, free radicals in brain metabolism and pathology, kidney damage, muscle damage. free radicals involvement in other disorders. Free radicals theory of ageing.</p> <p>Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, superoxide dismutase, catalase, glutathione peroxidase, glutathione, vitamin C, vitamin E, α-lipoic acid, melatonin. Synthetic antioxidants: butylated hydroxy toluene, butylated hydroxy anisole.</p> <p>Functional foods for chronic disease prevention.</p>	10 Hours	22.22%
5	<p>Effect of Processing, Storage and Interactions of Various Environmental Factors on the Potential of Nutraceuticals, Regulatory Aspects on Food Safety. Adulteration of Foods. Pharmacopoeial Specifications for Dietary Supplements and Nutraceuticals</p> <p>Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals.</p>	06 Hours	13.33%

Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods. Pharmacopoeial Specifications for dietary supplements and nutraceuticals		
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Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe and differentiate functional foods, nutraceuticals and dietary supplements
CO2	suggest the use of nutraceuticals in prevention and treatment of various diseases
CO3	summarize the regulatory requirements for nutraceuticals
CO4	describe the impact of various factors on stability of nutraceuticals

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11
CO1	2	-	-	-	-	-	-	-	-	-	3
CO2	2	-	2	-	-	-	-	-	-	-	2
CO3	2	-	-	-	-	-	-	-	1	-	3
CO4	3	-	2	-	-	-	-	-	-	-	-

Recommended Study Material:

1. Dietetics by Sri Lakshmi
2. Role of dietary fibres and nutraceuticals in preventing diseases by K.T Agusti and P.Faizal: BSPublication.
3. Advanced Nutritional Therapies by Cooper. K.A., (1996).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
5. Prescription for Nutritional Healing by James F. Balch and Phyllis A.Balch 2nd Edn., Avery Publishing Group, NY (1997).
6. G. Gibson and C.williams Editors 2000 Functional foods Woodhead Publ.Co.London.
7. Goldberg, I. Functional Foods. 1994. Chapman and Hall, New York.
8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in Essentials of Functional Foods M.K. Sachmidl and T.P. Labuza eds. Aspen Press.
9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)
10. Shils, ME, Olson, JA, Shike, M. 1994 Modern Nutrition in Health and Disease. Eighth edition. Lea and Febiger.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme

BPH8013: PHARMACEUTICAL PRODUCT DEVELOPMENT (Theory)

Total hours: 45 Hr

Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction to Pharmaceutical Product Development	10
2	An Advanced Study of Pharmaceutical Excipients in Pharmaceutical Product Development	10
3	An Advanced Study of Pharmaceutical Excipients in Pharmaceutical Product Development	10
4	Optimization Techniques in Pharmaceutical Product Development	8
5	Selection and Quality Control Testing of Packaging Materials for Pharmaceutical Product Development- Regulatory Considerations	7

Detailed Syllabus:

Sr. No.	UNIT	Hours	Weightage (%)
1.	Introduction to Pharmaceutical Product Development Introduction to pharmaceutical product development, objectives, regulations related to preformulation, formulation development, stability assessment, manufacturing and quality control testing of different types of dosage forms	10 Hours	22.22%
2.	An Advanced Study of Pharmaceutical Excipients in Pharmaceutical Product Development An advanced study of pharmaceutical excipients in pharmaceutical product development with a special reference to the following categories Solvents and solubilizers Cyclodextrins and their applications Non-ionic surfactants and their applications Polyethylene glycols and sorbitols Suspending and emulsifying agents Semi solid excipients	10 Hours	22.22%
3.	An Advanced Study of Pharmaceutical Excipients in Pharmaceutical Product Development	10 Hours	22.22%

	An advanced study of pharmaceutical excipients in pharmaceutical product development with a special reference to the following categories Tablet and capsule excipients Directly compressible vehicles Coat materials Excipients in parenteral and aerosols products Excipients for formulation of NDDS Selection and application of excipients in pharmaceutical formulations with specific industrial applications		
4.	Optimization Techniques in Pharmaceutical Product Development Optimization techniques in pharmaceutical product development. A study of various optimization techniques for pharmaceutical product development with specific examples. Optimization by factorial designs and their applications. A study of QbD and its application in pharmaceutical product development.	08 Hours	17.77%
5	Selection and Quality Control Testing of Packaging Materials for Pharmaceutical Product Development- Regulatory Considerations Selection and quality control testing of packaging materials for pharmaceutical product development- regulatory considerations.	07 Hours	15.55%

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	describe the fundamental aspects of pharmaceutical product development
CO2	enumerate the different class and applications of excipients used in development of pharmaceutical formulations.
CO3	summarize the different optimization techniques for development of products.
CO4	describe the regulatory and commercial aspects of packaging materials for pharmaceutical products

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	3
CO2	3	-	3	-	-	-	-	-	-	-	3
CO3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	3

Recommended Study Material:

1. Pharmaceutical Statistics Practical and Clinical Applications by Stanford Bolton, CharlesBon; Marcel Dekker Inc.
2. Encyclopedia of Pharmaceutical Technology, edited by James swarbrick, Third Edition, Informa Healthcare publishers.
3. Pharmaceutical Dosage Forms, Tablets, Volume II, edited by Herbert A. Lieberman and Leon Lachman; Marcel Dekker, Inc.
4. The Theory and Practice of Industrial Pharmacy, Fourth Edition, edited by Roop K. Khar, S P Vyas, Farhan J Ahmad, Gaurav K Jain; CBS Publishers and Distributors Pvt.Ltd. 2013.
5. Martin's Physical Pharmacy and Pharmaceutical Sciences, Fifth Edition, edited by Patrick J. Sinko, BI Publications Pvt. Ltd.
6. Targeted and Controlled Drug Delivery, Novel Carrier Systems by S. P. Vyas and R. K.Khar, CBS Publishers and Distributors Pvt. Ltd, First Edition 2012.
7. Pharmaceutical Dosage Forms and Drug Delivery Systems, Loyd V. Allen Jr., Nicholas B.Popovich, Howard C. Ansel, 9th Ed. 40
8. Aulton's Pharmaceutics – The Design and Manufacture of Medicines, Michael E. Aulton,3rd Ed.
9. Remington – The Science and Practice of Pharmacy, 20th Ed.
10. Pharmaceutical Dosage Forms – Tablets Vol 1 to 3, A. Liberman, Leon Lachman and Joseph B. Schwartz
11. Pharmaceutical Dosage Forms – Disperse Systems Vol 1 to 3, H.A. Liberman, Martin, M.R and Gilbert S. Banker.
12. Pharmaceutical Dosage Forms – Parenteral Medication Vol 1 & 2, Kenneth E. Avis and H.A. Libermann.
13. Advanced Review Articles related to the topics.

FACULTY OF PHARMACY
Bachelor of Pharmacy Programme
BPH8014: PROJECT WORK

Course Outcome (COs):

At the end of the course, the students would be able to

CO1	analyze the literature and identify the gap									
CO2	propose the solution and suggest the planning of the work									
CO3	implement the strategy and carry out the studies									
CO4	compile the results and rationalize the conclusion									
CO5	present the findings									
CO6	prepare report									

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3		-	-	-	-	-	-	-	3
CO3	3	-	3	3	-	-	-	-	-	-	3
CO4	3	-	-	3	-	3	-	3	-	-	3
CO5	3	-	-	-	-	-	-	-	-	-	3
CO6	3	-	-	-	-	-	3	3	-	-	3

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY (CHARUSAT)

List of University Elective Course (UG Semester 3)

Sr. No.	Faculty	Institute/ Department	Course Code	Course Name	MOOC course link	Course Syllabus
1	FTE	CSPIT- ME	MEUE201	Engineering Graphics and Design	https://archive.nptel.ac.in/courses/112/102/112102304/	https://drive.google.com/file/d/1aCyofGIN8CaOV8IZWQnVdL_GafyrL1GwT/view?usp=sharing
2		CSPIT- EE	EEUE201	Fundamentals Of Electrical Engineering	https://archive.nptel.ac.in/courses/108/105/108105112/	https://onlinecourses.nptel.ac.in/noc22_ee113/preview
3		CSPIT- CL	CLUE201	Environment and Development	https://nptel.ac.in/courses/109103186	Environment and Development - Course
4		CSPIT- EC	ECUE201	SCIENTIFIC COMPUTING USING MATLAB	https://archive.nptel.ac.in/courses/111/102/111102137/	https://archive.nptel.ac.in/content/syllabus_pdf/111102137.pdf
5		CSPIT- CE	CEUE201	The Joy of Computing using Python	https://nptel.ac.in/courses/106106182	https://nptel.ac.in/courses/106106182
6		CSPIT- IT	ITUE201	Introduction To Quantum Computing	https://nptel.ac.in/courses/106106232	https://archive.nptel.ac.in/content/syllabus_pdf/106106232.pdf
7		CSPIT- CSE	CSUE201	Python For Data Science	https://nptel.ac.in/courses/106106212	https://archive.nptel.ac.in/content/syllabus_pdf/106106212.pdf
8		CSPIT- AIML	AIUE201	An Introduction to Artificial Intelligence	https://nptel.ac.in/courses/106102220	https://nptel.ac.in/courses/106102220
9	FPH	RPCP	OCBPH2003	Cell Biology	https://archive.nptel.ac.in/courses/102/103/102103012/	https://archive.nptel.ac.in/content/syllabus_pdf/102103012.pdf
10	FAS					
11	FMS	IIIM	BMUD201	MONEY AND BANKING	https://nptel.ac.in/courses/109104076	https://archive.nptel.ac.in/content/syllabus_pdf/109104076.pdf
12	FCA	FCA	CAUD203	Human Computer Interactions	https://archive.nptel.ac.in/courses/106/106/106106177/	https://archive.nptel.ac.in/content/syllabus_pdf/106106177.pdf
13	FMS				https://onlinecourses.nptel.ac.in/noc22_ge18/preview	https://onlinecourses.nptel.ac.in/noc22_ge18/preview
14	Faculty of Medical Science	ARIP	PTUD191	Basics of Health Promotion and Education Intervention	https://onlinecourses.nptel.ac.in/noc22_ge18/preview	https://onlinecourses.nptel.ac.in/noc22_ge18/preview
15		MTIN	NRMD251	First Aid Masterclass- A complete guide to first aid	https://www.udemy.com/course/first-aid-masterclass/?coupon_code=NEWYEARCAREER	https://www.udemy.com/course/first-aid-masterclass/?coupon_code=NEWYEARCAREER

List of University Elective Course (UG Semester 4)

Sr. No.	Faculty	Institute/ Department	Course Code	Course Name	MOOC course link	Course Syllabus
1	FTE	CSPIT- ME	MEUE202	Nature and Properties of Materials	https://nptel.ac.in/courses/112104203	https://drive.google.com/file/d/1cHflA1njOjGuQqFzY19DEH_Q7fTxYt0p/view?usp=sharing
2		CSPIT- EE	EEUE202	Solar Energy Engineering and Technology	https://onlinecourses.nptel.ac.in/noc24_ge51/preview	https://onlinecourses.nptel.ac.in/noc24_ge51/preview
3		CSPIT- CL	CLUE202	Ecology and Environment	https://archive.nptel.ac.in/courses/127/106/127106004/	https://onlinecourses.nptel.ac.in/noc19_ge23/preview
4		CSPIT- EC	ECUE202	Introduction to Internet of Things	https://archive.nptel.ac.in/courses/106/105/106105166/#	https://archive.nptel.ac.in/content/syllabus_pdf/106105166.pdf
5		CSPIT- CE	CEUE202	Software Conceptual Design	https://nptel.ac.in/courses/106101235	https://nptel.ac.in/courses/106101235
6		CSPIT- IT	ITUE202	Ethical Hacking	https://nptel.ac.in/courses/106105217	https://nptel.ac.in/courses/106105217
7		CSPIT- CSE	CSUE202	Google Cloud Computing Foundations	https://nptel.ac.in/courses/106105223	https://archive.nptel.ac.in/content/syllabus_pdf/106105223.pdf

8		CSPIT- AIML	AIUE202	Social Network Analysis	https://nptel.ac.in/courses/106106239	https://nptel.ac.in/courses/106106239
9	FPH	RPCP	OCBPH2004	Speaking Effectively	https://archive.nptel.ac.in/courses/109/105/109105117/	https://archive.nptel.ac.in/content/syllabus_pdf/109105117.pdf
10	FAS					
11	Faculty of Management Studies	IIIM	BMUD251	ECONOMICS OF HEALTH AND HEALTH CARE	https://nptel.ac.in/courses/110104095	https://archive.nptel.ac.in/content/syllabus_pdf/110104095.pdf
12	FCA	FCA	CAUD204	MODERN APPLICATION DEVELOPMENT	https://archive.nptel.ac.in/courses/106/106/106106222/	https://archive.nptel.ac.in/content/syllabus_pdf/106106222.pdf
13		ARIP	PTUD192	Ergonomics Workplace Analysis	https://onlinecourses.nptel.ac.in/noc20_de12/preview	https://onlinecourses.nptel.ac.in/noc20_de12/preview
14	Faculty of Medical Science	MTIN	NRMD261	Mindfulness and Well-being: Living with Balance and Ease	https://www.coursera.org/learn/foundations-of-mindfulness-ii-living-with-balance-and-ease#modules	https://www.coursera.org/learn/foundations-of-mindfulness-ii-living-with-balance-and-ease#modules

List of University Elective Course (PG Semester 2)

Sr. No.	Faculty	Institute/ Department	Course Code	Course Name	MOOC course link	Course Syllabus
1	FTE	CSPIT- ME	FTUD551	Health and Safety Management	https://archive.nptel.ac.in/courses/114/106/114106017/	https://drive.google.com/file/d/1raUKLN24ZMq34g1Yp3HN9S_kNCyhtQI7F/view?usp=sharing
2		CSPIT- EE	NA	NA	NA	NA
3		CSPIT- CL	FTUD502	Sustainable Engineering Concepts and Life Cycle Analysis	https://archive.nptel.ac.in/courses/105/105/105105157/	https://onlinecourses.nptel.ac.in/noc21_ce47/preview
4						
5		CSPIT- CE	FTUD501	Blockchain and its Applications	https://onlinecourses.nptel.ac.in/noc24_cs15/preview	https://nptel.ac.in/courses/106105235
6		CSPIT- IT				
7		CSPIT- CSE				
8		CSPIT- AIML	NA	NA	NA	NA
9	FPH	RPCP	OCMPH1003	Introduction On Intellectual Property To Engineers And Technologists	https://onlinecourses.nptel.ac.in/noc25_hs38/p_review	https://onlinecourses.nptel.ac.in/noc25_hs38/preview
11	Faculty of Management Studies	FMS-MBA	MBUD557	Introduction to Operations Research	https://onlinecourses.nptel.ac.in/noc24_mg30/preview	https://onlinecourses.nptel.ac.in/noc24_mg30/preview
12	FCA	FCA	CAUD518	SOFTWARE PROJECT MANAGEMENT	https://archive.nptel.ac.in/courses/106/105/106105218/	https://archive.nptel.ac.in/content/syllabus_pdf/106105218.pdf
13	Faculty of Science	PDPIAS	FSUD551	Energy resources, economics and sustainability	https://nptel.ac.in/courses/109107397	https://onlinecourses.nptel.ac.in/noc24_hs77/preview
14	Faculty of Science	PDPIAS	FSUD552	Nuclear Astrophysics	https://nptel.ac.in/courses/115107130	https://onlinecourses.nptel.ac.in/noc24_ph11/preview
15	Faculty of Science	PDPIAS	FSUD553	Computational Science in Engineering	https://nptel.ac.in/courses/101104086	https://onlinecourses.nptel.ac.in/noc25_ae03/preview
16	Faculty of Science	PDPIAS	FSUD554	Plastic Waste Management	https://onlinecourses.nptel.ac.in/noc24_ce25/preview	https://nptel.ac.in/courses/105105184
17	FMD	ARIP	PTUD796	Yoga and Positive Psychology for Managing Career and Life	https://onlinecourses.nptel.ac.in/noc25_mg75/preview	https://onlinecourses.nptel.ac.in/noc25_mg75/preview
18		MTIN	NRMD551	Mindfulness and Well-being: Living with Balance and Ease	https://www.coursera.org/learn/foundations-of-mindfulness-ii-living-with-balance-and-ease#modules	https://www.coursera.org/learn/foundations-of-mindfulness-ii-living-with-balance-and-ease#modules

1.3 Learning Resources

Students can utilize library at RPCP or CHARUSAT Knowledge Resource Centre (situated in building A1)

1.4 Academic Calendar:

Ramanbhai Patel College of Pharmacy					
Charotar University of Science & Technology					
Tentative Planning for <u>Academic Year: 2025-2026 (Odd semester-1st Sem B.Pharm.)</u>					
Week	Date	Day	No. of working days	WD/H D	Activity
1	03.10.2025	Fri	2	WD	COMMENCEMENT OF 1st SEMESTER OF B.Pharm.
	04.10.2025	Sat		WD	Teaching-Learning for 1st sem B.Pharm.
	05.10.2025	Sun		HD	
2	06.10.2025	Mon	6	WD	
	07.10.2025	Tue		WD	-
	08.10.2025	We d		WD	-
	09.10.2025	Thu		WD	Teaching-Learning for 1st sem B.Pharm.
	10.10.2025	Fri		WD	-
	11.10.2025	Sat		WD	-
	12.10.2025	Sun		HD	
3	13.10.2025	Mon	5	WD	
	14.10.2025	Tue		WD	-
	15.10.2025	We d		WD	-
	16.10.2025	Thu		WD	Teaching-Learning for 1st sem B.Pharm.
	17.10.2025	Fri		WD	-
	18.10.2025	Sat		HD	
	19.10.2025	Sun		HD	
4	20.10.2025	Mon	0	HD	
	21.10.2025	Tue		HD	
	22.10.2025	We d		HD	
	23.10.2025	Thu		HD	
	24.10.2025	Fri		HD	
	25.10.2025	Sat		HD	
	26.10.2025	Sun		HD	Diwali vacation

5	27.10.2025	Mon	6	WD	<p style="text-align: center;"><u>CMA Topics Allotment</u></p> <p>Teaching-Learning for 1st sem B.Pharm.</p>
	28.10.2025	Tue		WD	
	29.10.2025	We d		WD	
	30.10.2025	Thu		WD	
	31.10.2025	Fri		WD	
	01.11.2025	Sat		WD	
	02.11.2025	Sun		HD	
6	03.11.2025	Mon	5	WD	<p style="text-align: center;"><u>Guru Nanak Jayanti</u></p> <p>Teaching-Learning for 1st sem B.Pharm.</p>
	04.11.2025	Tue		WD	
	05.11.2025	We d		HD	
	06.11.2025	Thu		WD	
	07.11.2025	Fri		WD	
	08.11.2025	Sat		WD	
	09.11.2025	Sun		HD	
7	10.11.2025	Mon	6	WD	<p style="text-align: center;">-</p> <p style="text-align: center;">-</p> <p style="text-align: center;">-</p> <p>Teaching-Learning for 1st sem B.Pharm.</p>
	11.11.2025	Tue		WD	
	12.11.2025	We d		WD	
	13.11.2025	Thu		WD	
	14.11.2025	Fri		WD	
	15.11.2025	Sat		WD	
	16.11.2025	Sun		HD	
8	17.11.2025	Mon	6	WD	<p style="text-align: center;">-</p> <p style="text-align: center;">-</p> <p style="text-align: center;">-</p> <p>Teaching-Learning for 1st sem B.Pharm.</p>
	18.11.2025	Tue		WD	
	19.11.2025	We d		WD	
	20.11.2025	Thu		WD	
	21.11.2025	Fri		WD	
	22.11.2025	Sat		WD	
	23.11.2025	Sun		HD	
9	24.11.2025	Mon	6	WD	<p style="text-align: center;">-</p> <p style="text-align: center;">-</p> <p style="text-align: center;">-</p> <p>Teaching-Learning for 1st sem B.Pharm.</p>
	25.11.2025	Tue		WD	
	26.11.2025	We d		WD	
	27.11.2025	Thu		WD	
	28.11.2025	Fri		WD	
	29.11.2025	Sat		WD	

	30.11.2025	Sun		HD	
10	01.12.2025	Mon	6	WD	Teaching-Learning for 1st sem B.Pharm.
	02.12.2025	Tue		WD	
	03.12.2025	We d		WD	
	04.12.2025	Thu		WD	
	05.12.2025	Fri		WD	
	06.12.2025	Sat		WD	
	07.12.2025	Sun		HD	
11	08.12.2025	Mon	6	WD	Teaching-Learning for 1st sem B.Pharm.
	09.12.2025	Tue		WD	
	10.12.2025	We d		WD	
	11.12.2025	Thu		WD	
	12.12.2025	Fri		WD	
	13.12.2025	Sat		WD	
	14.12.2025	Sun		HD	
12	15.12.2025	Mon	6	WD	Teaching-Learning for 1st sem B.Pharm.
	16.12.2025	Tue		WD	
	17.12.2025	We d		WD	
	18.12.2025	Thu		WD	
	19.12.2025	Fri		WD	
	20.12.2025	Sat		WD	
	21.12.2025	Sun		HD	
13	22.12.2025	Mon	5	WD	Teaching-Learning for 1st sem B.Pharm.
	23.12.2025	Tue		WD	
	24.12.2025	We d		WD	
	25.12.2025	Thu		HD	
	26.12.2025	Fri		WD	
	27.12.2025	Sat		WD	
	28.12.2025	Sun		HD	
14	29.12.2025	Mon	6	WD	<u>CMA evaluation</u> Teaching-Learning for 1st sem B.Pharm.
	30.12.2025	Tue		WD	
	31.12.2025	We d		WD	
	01.01.2026	Thu		WD	
	02.01.2026	Fri		WD	

	03.01.2026	Sat		WD	
	04.01.2026	Sun		HD	
15	05.01.2026	Mon	6	WD	<p style="text-align: center;"><u>Mid-semester Practical exam</u></p> <p>Teaching-Learning for 1st sem B.Pharm.</p>
	06.01.2026	Tue		WD	
	07.01.2026	We d		WD	
	08.01.2026	Thu		WD	
	09.01.2026	Fri		WD	
	10.01.2026	Sat		WD	
	11.01.2026	Sun		HD	
16	12.01.2026	Mon	4	WD	<p style="text-align: center;"><u>Makar Sankranti (Uttarayan)</u></p> <p>Teaching-Learning for 1st sem B.Pharm.</p>
	13.01.2026	Tue		WD	
	14.01.2026	We d		HD	
	15.01.2026	Thu		HD	
	16.01.2026	Fri		WD	
	17.01.2026	Sat		WD	
	18.01.2026	Sun		HD	
17	19.01.2026	Mon	6	WD	<p style="text-align: center;"><u>Mid-semester Theory exam</u></p> <p>Teaching-Learning for 1st sem B.Pharm.</p>
	20.01.2026	Tue		WD	
	21.01.2026	We d		WD	
	22.01.2026	Thu		WD	
	23.01.2026	Fri		WD	
	24.01.2026	Sat		WD	
	25.01.2026	Sun		HD	
18	26.01.2026	Mon	5	HD	<p style="text-align: center;"><u>Republic Day</u></p> <p>Teaching-Learning for 1st sem B.Pharm.</p>
	27.01.2026	Tue		WD	
	28.01.2026	We d		WD	
	29.01.2026	Thu		WD	
	30.01.2026	Fri		WD	
	31.01.2026	Sat		WD	
	01.02.2026	Sun		HD	
19	02.02.2026	Mon	6	WD	<p style="text-align: center;"><u>Journal Certification</u></p> <p>Teaching-Learning for 1st sem B.Pharm.</p>
	03.02.2026	Tue		WD	
	04.02.2026	We d		WD	
	05.02.2026	Thu		WD	
	06.02.2026	Fri		WD	

	07.02.2026	Sat		WD	
	08.02.2026	Sun		HD	
20	09.02.2026	Mon	6	WD	
	10.02.2026	Tue		WD	
	11.02.2026	We d		WD	
	12.02.2026	Thu		WD	
	13.02.2026	Fri		WD	
	14.02.2026	Sat		WD	
	15.02.2026	Sun		HD	
21	16.02.2026	Mon	6	WD	
	17.02.2026	Tue		WD	
	18.02.2026	We d		WD	
	19.02.2026	Thu		WD	
	20.02.2026	Fri		WD	
	21.02.2026	Sat		WD	
	22.02.2026	Sun		HD	
22	16.02.2026	Mon	6	WD	
	17.02.2026	Tue		WD	
	18.02.2026	We d		WD	
	19.02.2026	Thu		WD	
	20.02.2026	Fri		WD	
	21.02.2026	Sat		WD	
	22.02.2026	Sun		HD	
			116		

CHARUSAT EXAMINATION
(T/P)

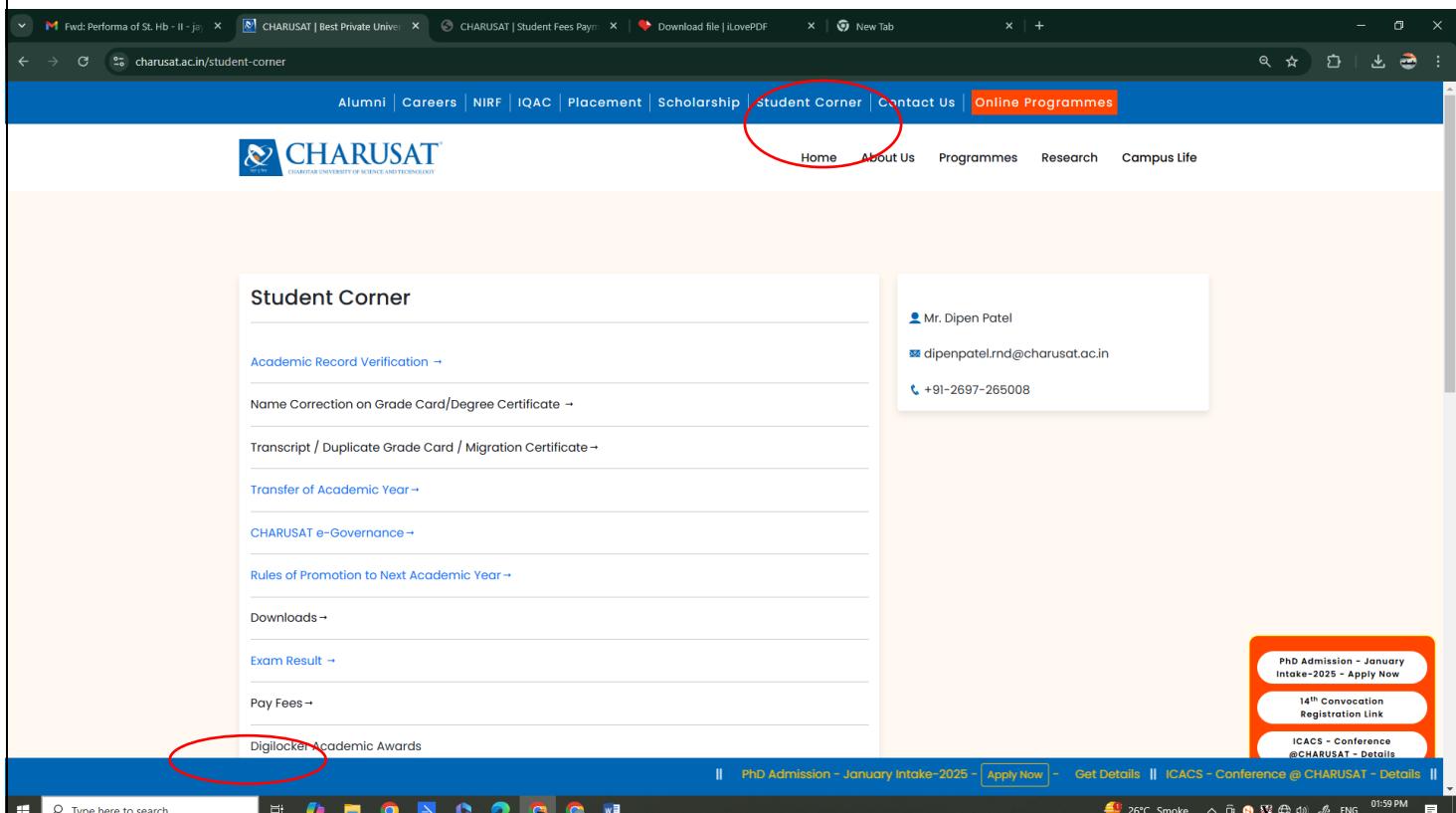
* Schedule is tentative, subject to change

SECTION - 2

VARIOUS ADMINISTRATIVE PROCESS

2.1 Payment of tuition fees or Other charges

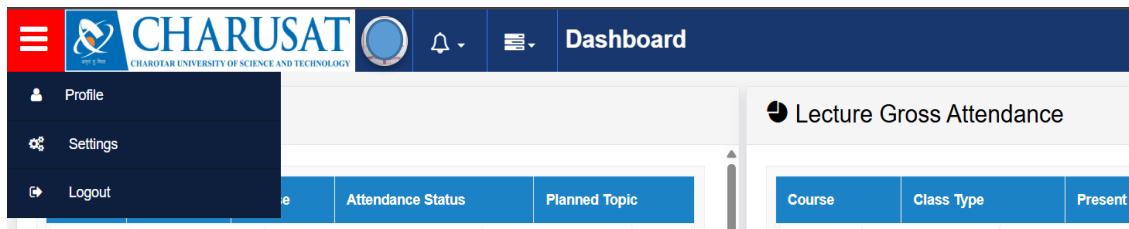
Step:1	Visit University web-portal click on Pay Fees: https://charusat.edu.in:912/FeesPaymentApp/
Step:2	Enter your Student ID and Pay your Fees
Step:3	Download your fees receipt



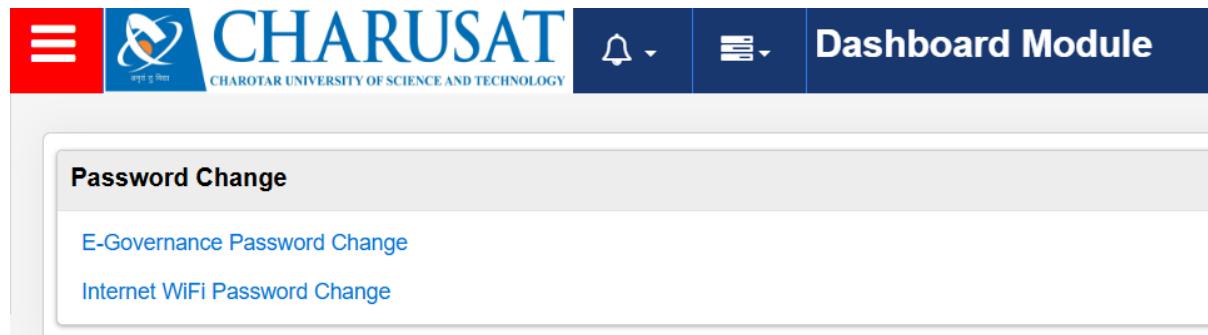
The screenshot shows a browser window with multiple tabs open. The active tab displays the CHARUSAT website at charusat.ac.in/student-corner. The page features a blue header bar with various navigation links: Alumni, Careers, NIRF, IQAC, Placement, Scholarship, Student Corner (which is highlighted with a red circle), Contact Us, and Online Programmes. Below the header is the CHARUSAT logo and a navigation menu with Home, About Us, Programmes, Research, and Campus Life. The main content area is titled "Student Corner" and contains several links: Academic Record Verification, Name Correction on Grade Card/Degree Certificate, Transcript / Duplicate Grade Card / Migration Certificate, Transfer of Academic Year, CHARUSAT e-Governance, Rules of Promotion to Next Academic Year, Downloads, Exam Result, Pay Fees, and Digilocker Academic Awards (which is circled with a red oval). To the right of the main content is a sidebar with contact information for Mr. Dipen Patel (Email: dipenpatel.rnd@charusat.ac.in, Phone: +91-2697-265008) and three orange buttons for PhD Admission, Convocation Registration, and ICACS Conference.

2.2 Process of Acquiring WIFI access

1. Go to e-governance website
 - a. <http://egov.charusat/>
2. Login into your student account using e-governance login credentials
3. Go to settings tab as how in picture below



4. Click on Internet WiFi password change



5. Change the password to get access to WiFi
 6. Save and remember your password
- Connect to wifi by authenticating your credentials on
<http://172.16.0.1:8090/httpclient.html>

2.3 Process to obtain required Certificate from the institute

Step:1	Visit Administrative office of RPCP
Step:2	Submit an application as per your requirement along with your ID Number (via Email: principal.rpcp@charusat.ac.in)
Step:3	Collect certificate form Administrative office (Room no: 129A, RPCP)

2.4 Process to obtain required Certificate from the university office

- In order to obtain the required certificate at the University Level, students need to visit the Student Corner of the CHARUSAT University website. They can choose to apply online or offline and should ensure to include all necessary enclosures with their application. The application must be submitted to the Student Section of the University and should be duly attested by the relevant institute's HoD / Principal/ Dean. Once all the necessary procedures are completed, the certificate will be issued at the University office. (As per the below):

The screenshot shows the official website of CHARUSAT (Chennai University of Science and Technology). The top navigation bar includes links for Alumni, Careers, NIRF, IQAC, Placement, Scholarship, Library-KRC, Student Corner, Contact Us, Online Programmes, and a search icon. The main menu features a logo for CHARUSAT and links for Home, About Us, Programmes, Research, Campus Life, and Enquire Now - Admission 2025. The central content area is titled "Student Corner" and lists various services: Academic Record Verification, Name Correction on Grade Card/Degree Certificate, Transcript / Duplicate Grade Card / Migration Certificate, Transfer of Academic Year, CHARUSAT e-Governance, Rules of Promotion to Next Academic Year, Downloads, Exam Result, Pay Fees, Digilocker Academic Awards (with sub-links for Information, Create Digilocker Account, and Fetch Document), Wellness Program, Student Code of Conduct, Students' Satisfaction Survey, Students' NDML Academic depository, Syllabus & Academic Regulations, Hostel, Fellowship -UG |PG |PhD |PDF, Student Development Initiatives, and Student Fee Refund Policy.

2.5 to 2.7 Process to obtain Duplicate Grade Card / Name Correction in Grade Card / Transcript OR E-transcript / Migration Certificate

Step:1	<p>Online Application Request through CHARUSAT Web Portal</p> <p>https://www.charusat.ac.in/student-corner</p> <p>Select Transcript / Duplicate Grade Card / Migration Certificate</p> <p>Select Document Type</p> <p>Migration Certificate</p> <p>Transcript/E-Transcript / WES</p> <p>Duplicate Grade Card</p> <p>Enter CHARUSAT Student ID</p>
Step:2	<p>Pay fees at online</p> <p>Download Payment Receipt (for further Communication)</p>
	<p>University will get request after successful Payment (Time is depend on clearing of payment)</p>
Collect the certificate within 15 days	

OR

Scan the below QR code



SCAN TO APPLY FOR

e-transcript

Duplicate Grade Card

Migration Certificate

Student will get an e-copy of the transcript on his/her
CHARUSAT e-mail id within 48 hrs working after the successful payment

2.8 Process for Academic Document Verification by External Agency

Step:1	Online Application Request through CHARUSAT Web Portal https://www.charusat.ac.in/student-corner
Step:2	Select Academic Record Verification menu
Step:3	Fill required Information
Step:4	Make Payment
Step:5	Please email Transaction receipt, Student Academic Verification Details (Transcript / Degree Certificate/ Marksheets) after completing the payment process. Email ID: <i>studentservices@charusat.ac.in</i> Email Subject: Academic Document Verification : < Student ID > : < Student Name >

SECTION - 3

UNDERTAKINGS

AND

DECLARATIONS

UNDERTAKING
(Observing Rules and Regulations of the University)

Roll No. _____

I, Mr./Ms. _____

son/daughter of _____ have secured

admission at the Indukaka Ipcowala Institute of Management of CHARUSAT

University in the academic year _____ for the _____ Programme.

We hereby confirm that we have gone through the academic rules and regulations of the Institute very carefully and we assure you that we will abide by the same.

Student Signature : _____

Name of the Parent/Guardian : 1. _____

2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____

DECLARATION **(Code of Conducts and Disciplinary Rules)**

I bearing roll no. admitted in (programme) of the Institute of....., CHARUSAT University, Changad hereby declare and undertake that I will abide by the Code of Conduct, including rules for misconduct/indiscipline by the students, provisions like dress code on the campus, rules for maintaining vehicles on the campus, public display of affection (PDA), etiquette on the campus etc.

I will abide by all the rules and regulations as and when intimated by the university and if I am found violating any rules then, I shall be subjected to the major/minor penalties as may deemed fit by the university.

Signature : _____

Name of the Parent/Guardian : 1. _____
2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____

UNDERTAKING
(Observing Rules & Regulations of the Examination)

I, Roll No..... studying in the First year of programme at Institute of, CHARUSAT University, Changa do hereby undertake that I have read and understood all the Rules & Regulations related to Academic Dishonesty at examinations/tests/assignments and punishment in case of using unfair means, I have also gone through the Academic Regulations related to Granting of Term and Cancellation of admission, and I shall observe, follow and abide by all these rules and regulations.

I shall abide by all the rules and regulations and if I am found violating any rules then, I shall be subjected to the necessary action/penalties as per provision of rules/regulations of the university.

Signature : _____

Name : _____

Address : _____

Signature of the Parent/Guardian : 1. _____ 2. _____

UNDERTAKING
(To Refrain from Consumption of Drugs and Alcohol)

I, _____ bearing Roll No._____ admitted in _____ (programme) at Institute of _____ hereby declare and undertake that I will refrain myself from possession / consumption of Drugs and Alcohol.

I know that the use/possession of narcotics drugs and alcohol is a punishable offence under the law of the Government of Gujarat and if I am found guilty of using such thing/s, then it will amount to a criminal offence and I am liable for the appropriate penalty as per laws and also liable to cancel my admission from the university.

I hereby give an undertaking to the Institute that I will refrain myself from possession or consumption of Drugs and Alcohol in and around the campus.

Date : _____

Place : _____ Signature of Student

I undertake that I will take utmost care to see that my ward does not get involved in any such incident.

Name of the Parent/Guardian : 1. _____

2. _____

Signature of the Parent/Guardian : 1. _____ 2. _____

Address of Parent/ Guardian : _____

Contact no of Parent/ Guardian : 1. _____ 2. _____

4. IMPORTANT CONTACTS

+91-02697-265011 (Last 4 digits: Extension number)

Name and Designation	Extension number & Email-id
Dr. Samir Patel Dean - Faculty of Pharmacy,	5161 dean.fph@charusat.ac.in
Dr. Manan Raval Principal, RPCP	5141 principal.rpcp@charusat.ac.in
Mr. Jaydeep Parmar P.A to Principal	5151 jaydeepparmar.ph@charusat.ac.in
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