Jawaharlal Nehru Technological University Anantapur

(Established by Govt. of A.P., Act. No. 30 of 2008)

Ananthapuramu–515 002 (A.P) India

Academic Regulations (R23) for B. Pharm. (Regular-Full time)

(Effective for the students admitted into I year from the Academic Year **2023-2024** onwards)

and

Academic Regulations (R23) for B. Pharm. (Lateral Entry Scheme)

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year **2024-2025** onwards)

1. **Award of the Degree**

   a) Award of the B. Pharm. Degree

   A student will be declared eligible for the award of the B. Pharm. degree if he/she fulfils the following:

   i) Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).
   ii) Registers for 208 credits and secures all 208 credits.

   b) Award of B. Pharm. degree with Honors / Research

   A student will be declared eligible for the award of the B. Pharm. with Honors/Research if he/she fulfils the following:

   i) A Student secures an additional 15 credits fulfilling all the requisites of a B. Pharm. programme i.e., 208 credits.
   ii) A student is permitted to register either for Honors or Research but not for both.
   iii) Registering for Honours/Research is optional.
   iv) Honors/Research is to be completed simultaneously with B. Pharm. programme.

2. Students who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission shall forfeit their seat in B. Pharm. course and their admission stands cancelled. This clause shall be read along with clause 1 a) i).

3. **Admissions**

   Admission to the B. Pharm. programme shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. **Program related terms:**

   i) ***Credit:*** A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

Credit definition

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	1 credit

   ii) ***Academic Year:*** Two consecutive (one odd + one even) semesters constitute one academic year.
   iii) ***Choice Based Credit System (CBCS):*** The CBCS provides a choice for students to select from the prescribed courses.

5. Course Classification

All subjects/ courses offered for the B.Pharm. programme are broadly classified as follows. The University has followed the guidelines issued by UGC/PCI.

S.No.	Broad Course Classification	Course Category	Description
1.	Foundation Courses	Fundamental courses	Includes sciences, humanities,social sciences and engineering courses
2.	Core Courses	Professional Core Courses (PC)	Includes core subjects related to the programme.
3.	ElectiveCourses	Professional Elective Courses (PE)	Includes elective subjects related to the programme.
		Open Elective Courses (OE)	Electives which include multidisciplinary subjects in an area outside the programme.
4.	Skill Courses	Skill Enhancement Courses (SEC)	Courses to develop and strengthen the necessary skills to gain, maintain, and advance in a chosen area.
5.	Project & Internships	Project	B. Pharm. Project or Major Project
		Internships	Community based and IndustryInternships
6.	Audit Courses	Mandatory noncredit courses	Covering subjects of developing desired attitude among the learners

6. Programme Pattern

i) The total duration of the B. Pharm. (Regular) programme is four academic years.

ii) Each academic year of study is divided into two semesters.

iii) The minimum number of instruction days in each semester is 90.

iv) There shall be a mandatory student induction program for freshers, with a three-week duration before the commencement of the first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Branch & Innovations etc., are to be included as per the AICTE guidelines.

v) Increased flexibility for students through an increase in the elective component of the curriculum.

vi) A pool of job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain and the other shall be a soft skills course.

vii) Students shall undergo practice school and mandatory internships.

viii) An undergraduate degree either with Honours or Research is introduced by the University for the students having good academic record.

ix) Each college shall assign a faculty advisor/mentor after admission to a group of students to provide guidance in courses registration / career growth / placements / opportunities for higher studies / GPAT / other competitive exams etc.

x) Preferably 25% of course work for the theory courses in every semester shall be conducted in the blended mode of learning.

7. Evaluation Process

The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks for theory and 100 marks for practical subject. Practice School and Internships shall be evaluated for 50 marks, Project work in the final semester shall be evaluated for 200 marks, mandatory courses with no credits shall be evaluated for 30 mid semester marks.

A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end examination marks taken together for the theory, practical or project etc. In the case of a mandatory course, he/she should secure 40% of the total marks.

i) For the theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
ii) For practical subjects, the distribution shall be 30 marks for the Internal Evaluation and 70 marks for the End- Examination.
iii) If any subject has both theory and practical components, they will be evaluated separately as theory subject and practical subject.

A. Theory Courses

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	**100**

Continuous Internal Evaluation

i) For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment.
ii) Objective paper shall contain for 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from 1 to 6) of which student has to answer one from each either-or type of questions. Each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.

Note:

- The objective paper shall be prepared in line with the quality of competitive examinations questions.
- The subjective paper shall contain 3 either or type questions of equal weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
- The objective paper shall be conducted by the respective institution on the day of subjective paper test.
- Assignments shall be in the form of mini projects, slip tests, quizzes etc., depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.

iii) If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.

iv) First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.

v) Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid: 25
Marks obtained in second mid: 20
Final mid semester Marks: (25x0.8) + (20x0.2) = 24

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other. For Example:

Marks obtained in first mid: Absent
Marks obtained in second mid: 25
Final mid semester Marks: (25x0.8) + (0x0.2) =20

End Examination Evaluation:

End examination of theory subjects shall have the following pattern:

i) There shall be 6 questions and all questions are compulsory.
ii) Question I shall contain 10 compulsory short answer questions for a total of 20marks such that each question carries 2 marks.
iii) There shall be 2 short answer questions from each unit.
iv) In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
v) The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.

B. Practical Courses

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	**100**

a) For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and the end examination shall be for 70 marks.
b) Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the record/viva and 15 marks for the internal test.
c) The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.
   - Procedure: 20 marks
   - Experimental work & Results: 30 marks
   - Synopsis: 10 marks
   - Viva voce: 10 marks.

C. There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case the student fails, a re-examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.

D. The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms andshall be produced to the Committees of the University as and when the same are asked for.

8. Skill oriented Courses

i) There shall be five skill-oriented courses offered during III to VII semesters.

ii) Out of the five skill courses, four shall be domain specific and other soft skills course.

iii) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.

iv) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.

v) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.

vi) The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the University at the beginning of the semester. The principal of the respective college shall forward such proposals to the University for approval.

vii) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the University.

9. Massive Open Online Courses (MOOCs):

A Student has to pursue and complete one course compulsorily through MOOCs approved by the University. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through MOOCs for awarding the degree. A student is not permitted to register and pursue core courses through MOOCs.

A student shall register for the course (Minimum of either 8 weeks or 12 weeks) offered through MOOCs with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.

Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for credit transfer as specified and are exempted from appearing internal as

well as external examination (for the specified equivalent credit course only) conducted by the university.

Necessary amendments in rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

10. Credit Transfer Policy

Adoption of MOOCs is mandatory, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of 20% of the total courses being offered in a particular programme through MOOCs platform.

i) The University shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
ii) Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information with the department.
iii) Credit transfer policy will be applicable to the Professional & Open Elective courses only.
iv) The concerned department shall identify the courses permitted for credit transfer.
v) The University/institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
vi) The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
vii) The university shall ensure no overlap of MOOC exams with that of the university examination schedule. In case of delay in results, the university will re-issue the marks sheet for such students.
viii) Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.
ix) The institution shall submit the following to the examination section of the university:
    a) List of students who have passed MOOC courses in the current semester along with the certificate of completion.
    b) Undertaking form filled by the students for credit transfer.
x) The universities shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall be permitted to register for MOOCs offered through online platforms approved by the University from time to time.

11. Academic Bank of Credits (ABC)

The University has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

i. provide option of mobility for learners across the universities of their choice
ii. provide option to gain the credits through MOOCs from approved digital platforms.
iii. facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC
iv. execute Multiple Entry and Exit system with credit count, credit transfer and credit

acceptance from students' account.

12. Summer Internships & Project Work

Summer Internships: Two summer internships either onsite or virtual each with a minimum of 08 weeks duration, done at the end of second and third years, respectively are mandatory. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations/NGOs & others. The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSCHE / University shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weightage each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the University.

Full Semester Internship and Project work: In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.

The project report shall be evaluated with an external examiner. The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the University and is evaluated for 140 marks.

The college shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

13. Guidelines for offering B. Pharm. with Honors / Research

The objective is to facilitate the students to choose specialized courses of their choice and build their competence in a specialized area at the UG level. The is an opportunity for students who have a good academic record and interest in higher studies and research.

B. Pharm. with Honors / Research is applicable to all the Regular and Lateral Entry students.

i) A student shall earn an additional 15 credits for the award of B. Pharm. (Honors / Research) degree. This is in addition to the credits essential for obtaining the B. Pharm. degree (i.e., 208 credits).
ii) A student is permitted to register for Honors / Research in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to the Honors / Research from V Semester onwards.
iii) The Concerned Principal of the college shall arrange separate class work and timetable of the courses offered under Honors / Research program.
iv) Courses that are used to fulfil the student's primary major may not be double counted towards the Honors / Research.
v) Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors / Research.
vi) Students can complete the courses offered under Honors / Research either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors / Research are offered in conventional mode, then the teaching and evaluation procedure shall be like the regular B. Pharm. programme.
vii) The attendance for the registered courses under Honors / Research and regular courses offered for Major degree in a semester are to be considered separately.
viii) A student shall maintain an attendance of 75% in all registered courses under Honors / Research to be eligible for attending semester end examinations.
ix) A student registered for Honors / Research shall pass in all subjects that constitute the requirement for the Honors / Research degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded.
x) If a student drops or is terminated from the Honors / Research program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
xi) The Honors / Research will be mentioned in the degree certificate as Bachelor of Pharmacy (Honors / Research).

Enrolment into Honors / Research:

i) The enrolment of students into Honors / Research is based on the percentage of marks obtained in the major degree program.
ii) The percentage of marks shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students.
iii) Students having 7 CGPA without any backlog subjects will be permitted to register for Honors / Research.
iv) If a student is detained due to lack of attendance either in Major or in Honors / Research, registration shall be cancelled.
v) The minimum strength required for offering Honors / Research offline is considered as 20% of the sanctioned intake. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department satisfying criteria for credit mobility.
vi) Transfer of credits from Honors / Research to regular B. Pharm. degree and vice versa shall not be permitted.
vii) Honors / Research is to be completed simultaneously with a Major degree program.

Registration for Honors / Research:

i) The institution will announce courses offered under Honors / Research before the start of the semester.
ii) The eligible and interested students shall apply through the HOD of the department. The whole

process should be completed within one week before the start of every semester. Selected students shall be permitted to register for the courses under Honors / Research.

iii) The selected students shall submit their willingness to the Principal through the department and the department shall maintain the record of students pursuing the Honors / Research.

iv) The students enrolled for the Honors/Research courses will be monitored continuously. An advisor/mentor from the department shall be assigned to monitor the progress.

v) There is no fee for registration of subjects for Honors / Research program offered in offline at the respective institutions.

14. Attendance Requirements:

i) A student shall be eligible to appear for the University external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

ii) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.

iii) A stipulated fee shall be payable towards condonation of shortage of attendance to the University.

iv) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.

v) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.

vi) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

vii) If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

viii) For induction programme attendance shall be maintained as per AICTE norms.

15. Promotion Rules:

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 16.

i) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university norms.

ii) A student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) up to in the subjects that have been studied up to III semester.

iii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) in the subjects that have been studied up to V semester.
And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

iv) When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

16. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System usingthe following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the marks in the subject fall	Grade	Grade points Assigned
90 & above	Superior	10
80 - 89	A (Excellent)	9
70 - 79	B (Very Good)	8
60 - 69	C (Good)	7
50 - 59	D (Average)	6
40 - 49	E (Pass)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.

ii) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall beindicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative GradePoint Average (CGPA):

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of thenumber of credits with the grade points scored by a student in all the courses taken bya student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \Sigma (C_i \times G_i)/\Sigma C_i$$

where, C_i is the number of credits of the i^{th} subject and G_i is the grade pointscored by the student in the i^{th} course.

The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \Sigma (C_i \times S_i)/ \Sigma C_i$$

where "S_i" is the SGPA of the i^{th} semester and C_i is the total numberof credits up to that semester.

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts. While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale. Letter Grade: It is an index of the performance of students in a said course. Grades aredenoted by the letters S, A, B, C, D and F.

Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Pharm. Degree, he/she shall be placed in one of the following four classes:

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 5.0 < 5.5

CGPA to Percentage conversion Formula – (CGPA – 0.5) x 10

17. With–holding of Results

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

18. Multiple Entry / Exit Option

(a) Exit Policy:

The students can choose to exit the four-year programme at the end of first/second/third year.

i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 52 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

ii) **UG Diploma (in Field of study/discipline)** - Programme duration: First two years (first four semesters) of the undergraduate programme, 104 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

iii) **Bachelor of Science (in Field of study/discipline)** - Programme duration: First three years (first six semesters) of the undergraduate programme, 160 credits.

(b) Entry Policy:

Modalities on multiple entry by the student into the B. Pharm. programme will be provided in due course of time.

Note: The Universities shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

19. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The principal of the respective college shall forward such proposals submitted by the students to the University. An evaluation committee constituted by the University shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not.

20. **Transitory Regulations**

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B. Pharm. from the date of commencement of class work, subject to Section **2** and they will follow the academic regulations into which they are readmitted.

21. Minimum Instruction Days for a Semester:

The minimum instruction days including exams for each semester shall be 90 days.

22. Medium of Instruction:

The medium of instruction of the entire B. Pharm. undergraduate programme (including examinations and project reports) will be in English only.

23. Student Transfers:

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the Universities from time to time.

24. **General Instructions:**

i. The academic regulations should be read as a whole for purpose of any interpretation.
ii. Malpractices rules-nature and punishments are appended.
iii. Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
v. The Universities may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.
vi. In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Vice-Chancellor / Head of the institution is final.

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ACADEMIC REGULATIONS (R23)

FOR B.PHARM. (LATERAL ENTRY SCHEME)

*(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year **2024-25** onwards)*

1. **Award of the Degree**
   a) Award of the B.Pharm. Degree if he/she fulfils the following:
      (i) Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).
      (ii) Registers for 156 credits and secures all 156 credits.

   b) Award of B.Pharm. degree **with Honors** / Research if he/she fulfils the following:
      (i) A Student secures an additional 15 credits fulfilling all the requisites of a B. Pharm. programme i.e., 208 credits.
      (ii) A student is permitted to register either for Honors or Research but not for both.
      (iii) Registering for Honours/Research is optional.
      (iv) Honors/Research is to be completed simultaneously with B. Pharm. programme.

2. Students who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat.

3. Minimum Academic Requirements:
   The following academic requirements must be satisfied in addition to the requirements mentioned for the regular B. Pharm. programme:
      i) A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end examination marks taken together for the theory, practical or project etc. In the case of a mandatory course, he/she should secure 40% of the total marks.
      ii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.

      And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

4. All other regulations applicable for B. Pharm. four-year degree course (Regular) will hold good for B. Pharm. (Lateral Entry Scheme).

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RULES FOR

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work andshall not be permitted to appear for the remaining examinations of the subjects of that semester/year. TheHall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred for four consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for four consecutive semesters from class work and all University examinations, if his involvement is established. Otherwise, the candidate is debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work andshall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from classwork and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject only.
6.	Refuses to obey the orders of the Chief Superintendent /Assistant - Superintendent /any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, orthreatens the officer-in charge or any person on duty inor outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or anyperson on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remainingexaminations of the subjects of that semester/year. If the candidate physically assaults the invigilator/ officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the policeand a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjectsthe candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of thesubjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. Thecontinuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjectsthe candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of thesubjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining

		examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person (s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjectsthe candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of thesubjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations, depending on the recommendation of the committee.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators.

i) Punishments to the candidates as per the above guidelines.
ii) Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
iii) A show cause notice shall be issued to the college.
iv) Impose a suitable fine on the college.
v) Shifting the examination center from the college to another college for a specific periodof not less than one year.

Note: Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he/she has to register for End Examinations in that subject/subjects consequently and has to fulfil allthe norms required for the award of Degree.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTHAPURAMU – 515 002 (A.P) INDIA

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B. Pharm. (Regular-Full time)

(Effective for the students admitted into I year from the Academic Year **2023-24** onwards)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

INDUCTION PROGRAMME

S.No.	Course Name	Category	L-T-P
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6
2	Counselling	MC	2-0-2
3	Career Options	MC	3-0-0
4	Orientation on admitted Branch	EC	2-0-3
5	Proficiency Modules & Productivity Tools	ES	2-1-2
6	Assessment on basic aptitude and skills	MC	2-0-3
7	Remedial Training in Foundation Courses	MC	2-1-2
8	Human Values & Professional Ethics	MC	3-0-0
9	Communication Skills, Listening, Speaking, Reading, Writing skills	BS	2-1-2
10	Programming Skills	ES	2-0-2

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year I Semester

SEMESTER - I						
S.No.	**Course Code**	**Course Name**	**Hours per Week**			**Credits**
			L	**T**	**P**	
1.	23BP101T	Human Anatomy and Physiology - I	3	1	-	4
2.	23BP102T	Pharmaceutical Analysis	3	1	-	4
3.	23BP103T	Pharmaceutics - I	3	-	-	3
4.	23BP104T	Pharmaceutical Inorganic Chemistry	3	-	-	3
5.	23BP105T	Communication Skills	2	-	-	2
6.	23BP106RBT 23BP106RMT	Remedial Biology[$] / Remedial Mathematics	2/3	-	-	2/3
7.	23BP101P	Human Anatomy and Physiology – I Lab	-	-	3	1.5
8.	23BP102P	Pharmaceutical Analysis Lab	-	-	3	1.5
9.	23BP103P	Pharmaceutics – I Lab	-	-	3	1.5
10.	23BP104P	Pharmaceutical Inorganic Chemistry Lab	-	-	3	1.5
11.	23BP105P	Communication Skills Lab	-	-	2	1
12.	23BP106RBP	Remedial Biology Lab[$]	-	-	2	1
		Total	16/17	2	16/14	26

[$]Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB) course**.**

I Year II Semester

SEMESTER - II						
S.No.	**Course Code**	**Course Name**	**Hours per week**			**Credits**
			L	T	P	
1.	23BP201T	Human Anatomy and Physiology - II	3	1	-	4
2.	23BP202T	Pharmaceutical Organic Chemistry - I	3	1	-	4
3.	23BP203T	Biochemistry	3	1	-	4
4.	23BP204T	Computer Applications in Pharmacy	3	-	-	3
5.	23BP205T	Environmental Sciences	2	-	-	2
6.	23BP206T	Social and Preventive Pharmacy	3	-	-	3
7.	23BP201P	Human Anatomy and Physiology – II Lab		-	3	1.5
8.	23BP202P	Pharmaceutical Organic Chemistry – I Lab		-	3	1.5
9.	23BP203P	Biochemistry Lab		-	3	1.5
10.	23BP204P	Computer Applications in Pharmacy Lab		-	3	1.5
		Total	17	3	12	26

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semester

L	T	P	C
3	1	0	4

(23BP101T) HUMANAN ATOMY AND PHYSIOLOGY-I

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of this course the student should be able to

- Explain the gross morphology, structure and functions of various organs of the human body.
- Describe the various homeostatic mechanisms and theirim balances.
- Identify the various issues and organs of different systems of the human body.
- Perform various experiments related to special senses and nervous system.
- Appreciate coordinated working pattern of different organs of each system.

UNIT I

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.

Cellular level of organization

Structure and functions of cell, transport across cellmembrane, cell division, cell junctions. General principles of cell communication, intracellularsig nalingpath way activation by extra cellular signal molecule, Forms of intracellular signaling a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine

Tissue level of organization

Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

UNIT II

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 appendicul arskeletal system

Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction

Joints

Structural and functional classification, types of joints movements and itsarticulation

UNIT III

Body fluids and blood

Body fluids, composition and functions of blood, hemopoeis is, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rhfactors, transfusion, its significance and disorders of blood, Reticuloendothelial system.

Lymphatic system

Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

UNIT IV

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.

UNIT V

Cardiovascular system

Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, lements of conduction system of heart and heartbeat, its regulation by autonomic nervous system, cardiac output, cardiaccycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

Recommended Books (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers' 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. Textbook of Medical Physiology- Arthur C, GuytonandJohn.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 Books (Latest Editions)

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. Chatterrje, Academic Publishers Kolkata

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semester

L	T	P	C
3	1	0	4

(23BP102T) PHARMACEUTICAL ANALYSIS

45 Hours

Scope: This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

Objectives: Upon completion of the course student shall be able to
- Understand the principles of volumetric and electrochemical analysis.
- Carryout various volumetric and electro chemical titrations
- Develop analytical skills.

UNIT I

(a) Pharmaceutical analysis-Definition and scope
- i) Different techniques of analysis
- ii) Methods of expressing concentration
- iii) Primary and secondary standards.
- iv) Preparation and standardization of various molar and normal solutions-Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuricacid, potassium permanganate and cericammonium sulphate

(b) Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures

UNIT II

Acid base 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.
Non aqueous titration: Solvents, acidimetry and alkalime trytitration and estimation of Sodium benzoate and Ephedrine HCl

UNIT III

Precipitation titrations: Mohr'smethod, Volhard's, Modified Volhard's, Fajansmethod, estimation of sodium chloride.
Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calciumgluconate.
Gravimetry: Principle and steps involved in gravimetric analysis. Purityof the precipitate: co-precipitation and post precipitation, Estimation ofbariumsulphate.
Basic Principles, methods and application of diazotization titration.

UNIT IV

Redoxtitrations
- (a) Concepts of oxidation and reduction
- (b) Types of redoxtitrations (Principles and applications)

Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassiumiodate

UNIT V

Electrochemical methods of analysis
Conductometry- Introduction, Conductivity cell, Conductometrictitrations, applications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

Potentiometry- 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 potentiometrictitration and applications.
Polarography-Principle, Ilkovicequation, construction and working of dropping mercury electrode androtating platinum electrode, applications.

Recommended Books: (Latest Editions)

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

Reference Books (Latest Editions)

1. Bassett J, Denny R C, Jeffery G H, Mendharn J, Vogel's Textbook of Quantitative Inorganic Analysis, 7th edition, ELBS/Longman, Londo, 1988
2. Ewing. Grant, Statistical Quality control 6. Instrumental methods of Analysis, 6thedition, McGraw Hill, 1988
3. Connors KA, A Textbook of Pharmaceutical Analysis, 3rdedition, Wiley Interscience, New York, 1982

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semester

L	T	P	C
3	0	0	3

(23BP103T) PHARMACEUTICS-I

45 Hours

Scope: This course is designed to impart fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

Objectives: Upon completion of this course the students hould be able to:

- Know the history of profession of pharmacy.
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations.
- Understand the professional way of handling the prescription.
- Preparation of various conventional dosage forms

UNIT I

Historical background and development ofprofession of pharmacy: History of profession of Pharmacy in India in relation to pharmacy education, industryand organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharma copoeia. Latin terms used in prescription.

Dosage forms: Introduction to dosage forms, classification and definitions

Prescription: Definition, Parts of prescription, handling of Prescription and Errors inprescription.

Posology: Definition, Factorsaffectingposology. Pediatricdose calculations based on age, body weight and body surface area.

UNIT II

Pharmaceutical calculations: Weights and measures–Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.

Powders: Definition, classification, advantages and disadvantages, Simple & compound powders–official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.

Liquid dosage forms: Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques

UNIT III

Monophasicliquids: Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasaldrops, Enemas, Syrups, Elixirs, Liniments and Lotions.

Biphasicliquids:

Suspensions: Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stabilityproblems andmethods to overcome.

Emulsions: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

UNIT IV

Suppositories: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.

Pharmaceutical incompatibilities: Definition, classification, physical, chemical, and therapeuticin compatibilities with examples.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

UNIV V

Semi solid dosage forms: Definitions, classification, mechanisms and factors in fluencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi soliddosages forms

Recommended Books: (Latest Editions)

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 Textbook 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 Nieloudand Gilberte Marti-Mestres: PharmaceuticalEmulsionsand Suspensions, Marcel Dekker, INC, New York.

Reference Books (Latest Editions)

1. Allen, Loyd V., Jr, Remington-The Science and Practice of Pharmacy (Vol.1& 2), 22nd edition, Lippincott Williams &Wilkins, 2012
2. J.W. Cooper, Colin Gunn, Tutorial Pharmacy, 4th edition, Sir Isaac Pitman & Sons Ltd., London, 1950
3. Michael E. Aulton, Pharmaceutics: The Science Of Dosage FormDesign, Churchill-Livingstone, 1988

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semester

L	T	P	C
3	0	0	3

(23BP104T) PHARMACEUTICAL INORGANIC CHEMISTRY

45 Hours

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals.

Objectives: Upon completion of course, student shall be able to

- Know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.
- Understand the medicinal and pharmaceutical importance of inorganic compounds.

UNIT I

Impurities in pharmaceutical substances: History of Pharmacopoeia, Sources and types of impurities, principle in volvedin the limittest for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate

General methods of preparation, assay for the compounds super scripted with **asterisk (*),** properties and medicinal uses of inorganic compounds belonging to the following classes

UNIT II

Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers inpharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

Majorextra and intracellular electrolytes: Functions of major physiologicalions, Electroly tesusedinthe 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.

UNIT III

Gastrointestinal agents

Acidifiers: Ammonium chloride* and Dil. HCl

Antacid: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture

Cathartics: Magnesiumsulphate, Sodium orthophosphate, Kaolin and Bentonite

Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinatedlime*, Iodineandits preparations

UNIT IV

Miscellaneous compounds

Expectorants: Potassium iodide, Ammonium chloride*. Emetics: Copper sulphate*, Sodium potassium tartarate Haematinics: Ferroussulphate*,Ferrous gluconate

Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodiumnitrite 333

Astringents: ZincSulphate, Potash Alum

UNIT V

Radio pharmaceuticals: Radioactivity, Measurement of radioactivity, Properties of α, β, γ radiations, Half life, radio isotopes and study of radioisotopes-SodiumiodideI^{131}, introduction to radio contrast

agents used in diagnosis, Storage conditions, precautions & pharmaceutical application of radioactive substances.

Recommended Books (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4th edition.
2. A.I. Vogel, Textbook of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3rd 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

Reference Books (Latest Editions)

1. J.H. Block, E. Roche, T.O. Soine and C. O. Wilson: Inorganic Medicinal and Pharmaceutical chemistry, Lee Febiger, Philadelphia. PA.
2. Roger's Inorganic Pharmaceutical Chemistry.
3. S.N. Pandeya: A Textbook of inorganic medicinal chemistry, S.G.Publishers, Varanasi.
4. M. Ali: Textbook of Pharmaceutical Inorganic chemistry, CBS, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semester

L	T	P	C
2	0	0	2

(23BP105T) COMMUNICATION SKILLS

30 Hours

Scope: This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Objectives: Upon completion of the course the student shall be able to

- Understand the behavioral needs for a pharmacist to function effectively in the areas of pharmaceutical operation.
- Communicate effectively (Verbal and Non-Verbal)
- Effectively manage the team as a team player
- Develop interview skills.
- Develop Leadership qualities and essentials.

UNIT I

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

UNIT II

Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication

Communication Styles: Introduction, The Communication Styles Matrix with example for each-Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

UNIT III

Basic Listening Skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations

Effective Written Communication: Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication

Writing Effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

UNIT IV

Interview Skills: Purpose of anointer view, Do's and Dont'so faninte rview

Giving Presentations: Dealing with Fears, planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

UNIT V

Group Discussion: Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

Recommended Books: (Latest Edition)

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

Reference Books (Latest Editions)

1. Elements of style – Strunk and white
2. Industrial Psychology and sociology for B. Pharmacy students. The author is Prof. B.V. Pathak.
3. Schermerhorn, Hunt, and Osborn, Organizational Behavior, Seventh Edition, Wiley, 2010
4. Stephen.P. Robbins, OrganizationBehavior, Prentive-Hall, India

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semester

L	T	P	C
3	0	0	3

(23BP106RBT) REMEDIALBIOLOGY

30 Hours

Scope: To learn and understand the components of the living world, structure and functional system of plants and animal kingdom.

Objectives: Upon completion of the course, the student shall be able to

- Know the classification and salient features of five kingdoms of life.
- Understand the basic components of anatomy & physiology of plants.
- Know the basic components of anatomy & physiology animal with special reference to human

UNIT I

Living world:

Definition and characters of living or ganisms
Diversity in the living world
Binomial nomenclature
Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae, Virus,

Morphology of Flowering plants

Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed.
General Anatomy of Root, stem, leaf of monocotyledons & Dicotylidones.

UNIT II

Body fluids and circulation

Composition of blood, blood groups, coagulation of blood
Composition and functions of lymph
Human circulatory system
Structure of human heart and blood vessels
Cardiaccycle, cardiacoutput and ECG

Digestion and Absorption

Human alimentary canaland digestive lands
Role of digestiveen zymes
Digestion, absorption and assimilation of digested food

Breathing and respiration

Human respiratory system
Mechanism of breathing and its regulation
Exchange of gases, transport of gases and regulation of respiration
Respiratory volumes

UNIT III

Excretory products and their elimination

Modes of excretion
Human excretory system- structure and function
Urine formation
Renninangiotens in system

Neural control and coordination

Definition and classification of nervous system

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

Structure of a neuron
Generation and conduction of nerveim pulse
Structure of brain and spinalcord
Functions of cerebrum, cerebellum, hypothalamus and medullaoblongata
Chemical coordination and regulation
Endocrinegl and sand their secretions.
Functions of hormones secreted by endocrine glands.
Human reproduction
Parts of female reproductiv e system
Parts of male reproductive system
Spermatogenesis and Oogenesis
Menstrual cycle

UNIT IV
Plants and mineral nutrition:
Essential mineral, macro and micronutrients
Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation
Photosynthesis
Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

UNIT V
Plantrespiration: Respiration, glycolysis, fermentation (anaerobic).
Plantgrowth and development
Phasesandrate of plant growth, Condition of growth, Introduction to plant growth regulators
Cell-Theunitoflife
Structure and functions of cell and cell or ganelles. Cell division
Tissues
Definition, types of tissues, location and functions.

Textbooks

1. Textbook of Biology by S.B. Gokhale
2. A Textbook of Biology by Dr. Thulajappaand, Dr. Seetaram.

Reference Books

1. A Textbook of Biology by B.V. SreenivasaNaidu
2. A Textbook of Biology by Naidu and Murthy
3. Botany for Degree students By A.C. Dutta.
4. Outlines of Zoology by M. Ekambaranathaayyerand T.N. Ananthakrishnan.
5. Amanual for pharmaceutical biology practical by S.B. Gokhale and C.K. Kokate

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B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semester

L	T	P	C
3	0	0	3

(23BP106RMT) REMEDIAL MATHEMATICS

30 Hours

Scope: This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplacetrans form.

Objectives: Upon completion of the course the student shall be able to

- Know the theory and their application in Pharmacy.
- Solve the different types of problems by applying theory.
- Appreciate the important application of mathematics in Pharmacy.

UNIT I

Partial fractions

Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction.

Logarithms

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples.

Functions, Limits and Continuity*:*

Real Valued function, Classification of real valued functions, Introduction to Limit of a function, Definition of limit of a function (€ - δ definition),

$$\lim_{x \to a} \frac{x^n - a^n}{x-a} = na^{n-1}, \quad \lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1,$$

UNIT II

Matrices and Determinant:

Introduction matrices, Types of matrices, Operation on matrices, Transpose of amatrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singularand non-singularmatrices, Inverse of a matrix, Solution of system of linear of equations usingmatrix method.

UNIT III

Calculus

Differentiation: Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula)–**Without Proof**, Derivative of x^n *w.r.t* x, where *n* is any rational number, Derivative of e^x, Derivative of $\log_e x$, Derivative of a^x, Derivative of trigonometric functions from first principles **(withoutProof)**, Successive Differentiation, Conditions for a function to be a maximum ora minimum at a point.

UNIT IV

Analytical Geometry

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

Introduction: Signs of the Coordinates, Distance formula,
Straight Line: Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope– intercept form of a straight line.
UNITV
Integration: Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application
Differential Equations: Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations, Linear Differential equations, Exact equations

Recommended Books (Latest Edition)

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan
4. Higher Engineering Mathematics by Dr.B.S. Grewal
5. Intermediate mathematics books from Telugu Academy
6. An introduction to Differential Equation by R.K. Gosh & K.C. Maity

Reference Books

1. Bali NP, Gupta PN, Gandhi CP, A Textbook of Pharmaceutical Mathematics (Remedial Mathematics Vol.I and Vol. II).
2. Jain RK, Iyengar SRK, Advanced Engineering Mathematics, 3rd Edition, Naros, 2007
3. Wartikar PN, Wartikar JN, Elements of Applied Mathematics,6th Edition, Pune VidyarthiGraha, 1997

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semester

L	T	P	C
0	0	3	1.5

(23BP107P) HUMANAN ATOMY AND PHYSIOLOGY LAB)

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject**.**

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. Introduction to hemocytometry.
7. Enumeration of whitebloodcell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocytesedimentation rate (ESR).
14. Determination of heartrate and pulserate.
15. Recording of blood pressure.

Recommended Textbooks:

1. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
2. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semester

L	T	P	C
0	0	3	1.5

(23BP108P) PHARMACEUTICAL ANALYSIS LAB

I Preparation and standardization of

(1) Sodium hydroxide
(2) Sulphuric acid
(3) Sodium thiosulfate
(4) Potassium permanganate
(5) Cericammonium sulphate

II Assay of the follow ingcompounds along with Standardization of Titrant

(1) Ammonium chloride by acid base titration
(2) Ferrous sulphate by Cerimetry
(3) Copper sulphate by Iodometry
(4) Calcium gluconate by complexometry
(5) Hydrogen peroxide by Permanganometry
(6) Sodium benzoate by non-aqueous titration
(7) Sodium Chloride by precipitation titration

III Determination of Normality by electro-analytical methods

(1) Conductometric titration of strong acid against strong base
(2) Conductometric titration of strong acid and weak acid against strong base
(3) Potentiometric titration of strong acid against strong base

Recommended Books: (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. A.I. Vogel, Textbook of Quantitative Inorganic analysis

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semester

L	T	P	C
0	0	3	1.5

(23BP109P) PHARMACEUTICS - I LAB

1. Syrups

a. Syrup IP'66
b. Compound syrup of Ferrous Phosphate BPC'68

2. Elixirs

a. Piperazine citrate elixir
b. Paracetamol pediatric elixir

3. Linctus

a. Terpin Hydrate Linctus IP'66
b. Iodine Throat Paint (Mandles Paint)

4. Solutions

a. Strong solution of ammonium acetate
b. Cresol with soap solution
c. Lugol's solution

5. Suspensions

a. Calamine lotion
b. Magnesium Hydroxide mixture
c. Aluminimum Hydroxide gel

6. Emulsions

a. Turpentine Liniment
b. Liquid paraffin emulsion

7. Powders and Granules

a. ORS powder (WHO)
b. Effervescent granules
c. Dusting powder
d. Divided powders

8. Suppositories

a. Glycero gelatin suppository
b. Coca butter suppository
c. Zinc Oxide suppository

9. Semisolids

a. Sulphur ointment
b. Non-staining-Iodine Ointment with methyl salicylate
c. Carbopal gel

10. Gargles and Mouthwashes

a. Iodine gargle
b. Chlorhexidine mouthwash

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B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

Recommended Books: (Latest Editions)

1. M.E. Aulton, Pharmaceutics, The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.
2. Indian pharmacopoeia.
3. British pharmacopoeia.
4. Lachmann. Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The University of Michigan.
5. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.

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B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semester

L	T	P	C
0	0	3	1.5

(23BP110P) PHARMACEUTICAL INORGANIC CHEMISTRY LAB

1. **Limit tests for following ions**
   i) Limit test for Chlorides and Sulphates
   ii) Modified limit test for Chlorides and Sulphates
   iii) Limit test for Iron
   iv) Limit test for Heavy metals Limit test for Lead
   v) Limit test for Arsenic

2. **Identification test**
   Magnesium hydroxide, Ferrous sulphate, Sodium bicarbonate, Calcium gluconate, Copper sulphate

3. **Test for purity**
   i) Swelling power of Bentonite
   ii) Neutralizing capacity of aluminum hydroxide gel
   iii) Determination of potassium iodate and iodine in potassium Iodide
   iv) Preparation of inorganic pharmaceuticals
   v) Boric acid Potash alum Ferrous sulphate

Recommended Books: (Latest Editions)

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

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B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semester

L	T	P	C
0	0	2	1

(23BP111P) COMMUNICATION SKILLS LAB

The following learning modules are to be conducted using words worth English language lab software:

1. Basic communication covering the following topics.
2. Meeting People Asking Questions Making Friends What did you do? Do's and Dont's
3. Pronunciations covering the following topics Pronunciation (Consonant Sounds) Pronunciation and Nouns
4. Pronunciation (Vowel Sounds)
5. Advanced Learning
6. Listening Comprehension / Direct and Indirect Speech Figures of Speech
7. Effective Communication Writing Skills
8. Effective Writing Interview Handling Skills E-Mail Etiquette Presentation Skills

Recommended Books: (Latest Edition)

1. Basic communication skills for Technology, Andreja. J. Ruther Ford,
2. 2 nd Edition, Pearson Education, 2011 2. Communication skills, Sanjay Kumar, Pushpalata, 1 stEdition, Oxford Press, 2011

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B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. I Semeter

L	T	P	C
0	0	2	1

(23BP112RBP) REMEDIAL BIOLOGY LAB

30 Hours

1. Introduction to experiments in biology
    a. Study of Microscope
    b. Section cutting techniques.
    c. Mounting and staining
    d. Permanent slide preparation
2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues pertinent to Stem, Root Leaf, seed, fruit and flower
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume

Textbooks

1. Textbook of Biology by S. B. Gokhale b.
2. A Textbook of Biology by Dr. Thulajappa and Dr. Seetaram.

Reference Books

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. Kokate and S.P. Shriwastava.
3. Biology practical manual according to National core curriculum. Biology forum of Karnataka. Prof.M.J.H. Shafi

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B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. II Semester

L	T	P	C
3	1	0	4

(23BP201T) HUMAN ANATOMY AND PHYSIOLOGY – II

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of this course the student should be able to

- Explain the gross morphology, structure, and functions of various organs of the human body.
- Describe the various homeostatic mechanisms and their imbalances.
- Identify the various tissues and organs of different systems of the human body.
- Perform hematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
- Appreciate coordinated working pattern of different organs of each system.
- Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

UNIT I

Nervous system: Organization of nervous system, neuron, neuroglia, classification and properties of nerve fiber, electro physiology, 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)

UNIT II

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 intestineand large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

Energetics

Formation and role of ATP, Creatinine Phosphate and BMR.

UNIT III

Respiratory system

Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration, 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.

UNIT IV

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.

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UNIT V

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

Recommended Books (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers' medical publishers, New Delhi.
2. Anatomy and Physiology in Healthand 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. Textbook of Medical Physiology- Arthur C, Guytonand 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 brothers' medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers' medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference Books:

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. Chatterrje, Academic Publishers Kolkata

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B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. II Semester

L	T	P	C
3	1	0	4

(23BP202T) PHARMACEUTICAL ORGANIC CHEMISTRY–I

45 Hours

Scope: This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes mechanisms and orientation of reactions.

Objectives: Upon completion of the course the student shall be able to

- Write the structure, name and the type of isomerism of the organic compound.
- Write the reaction, name the reaction and orientation of reactions.
- Account for reactivity/stability of compounds,
- Identify/confirm the identification of organic compounds.

Course Content: 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

UNIT I

Classification, nomenclature and isomerism

Classification of Organic Compounds

Common and IUPAC systems of nomenclature of organic compounds (upto10 Carbons open chain and Cyclic compounds)

Alkanes*, Alkenes*, Alkynes and Conjugated dienes*

SP3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP2 hybridization in alkenes

Heterocyclic compounds:

Nomenclature and classification

Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene. Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene

UNIT II

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.

Alkyl halides*

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 reactions.

Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetra chloromethane and iodoform.

Conjugated system: Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

UNIT III

Alcohols*- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

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B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

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.

UNIT IV
Carboxylic acids*
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
Aromatic Acids* –Acidity, effect of substituents on acidity and important reactions of benzoic acid.
Phenols* - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols
Aliphatic amines* - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine
Aromatic Amines* - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts

UNIT V **10 Hours**
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
Geometrical isomerism
Nomenclature of geometrical isomers (Cis / Trans, E/Z, 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 stereoselective reactions

Recommended Books (Latest Editions)
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 textbook 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.

Reference Books:
1. J. McMurry, Brooks/Cole, Organic Chemistry, 6th Ed. 2004
2. T.W.G. Solomons, C.B. Fryhle, Organic Chemistry, John Wiley and Sons Inc., 10th Ed. 2009
3. L.G. Wade Jr, Organic Chemistry, Pearson Education India, 2008
4. E.L. Eliel, Stereochemistry of Carbon compounds, Mcgraw-Hill, 1962

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B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. II Semester

L	T	P	C
3	1	0	4

(23BP203T) BIOCHEMISTRY

45 Hours

Scope: Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

Objectives:

Upon completion of course student shell able to

- Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
- Understand the metabolism of nutrient molecules in physiological and pathological conditions.
- Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

UNIT I

Biomolecules

Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

Bioenergetics

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

UNIT II

Carbohydrate metabolism

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

Electron transport chain (ETC) and its mechanism.

Oxidative phosphorylation & its mechanism and substrate phosphorylation Inhibitors ETC and oxidative phosphorylation/Uncouplers level

UNIT III

Lipid metabolism

β-Oxidation of saturated fatty acid (Palmitic acid)

Formation and utilization of ketone bodies; ketoacidosis De novo synthesis of fatty acids (Palmitic acid)

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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

Amino acid metabolism

General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders

Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia)

Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline

Catabolism of heme; hyperbilirubinemia and jaundice

UNIT IV

Nucleic acid metabolism and genetic information transfer

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 inhibitor

UNIT V

Enzymes

Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)

Enzyme inhibitors with examples

Regulation of enzymes: Enzyme induction and repression, allosteric enzymes regulation

Therapeutic and diagnostic applications of enzymes and isoenzymes Coenzymes –Structure and biochemical functions

Recommended Books (Latest Editions)

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.

Reference Books:

1. Lehninger AL, Nelson DL and Cox MM, Principles of Biochemistry, 5thEdition, MacMillan, 2008
2. Berg, Jeremy M., John L. Tymoczko, Lubert Stryer, and L. Stryer. Biochemistry. 5th edit. 2002.
3. Murray, R. K., D. K. Granner, P. A. Mayes, and V. Rodwell. W. Harper's Illustrated Biochemistry 26th Edition ed. 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. II Semester

L	T	P	C
3	0	0	3

(23BP204T) COMPUTER APPLICATIONS IN PHARMACY

45 Hours

Scope: This subject deals with the introduction of Database, Database Management system, computer application in clinical studies and use of databases.

Objectives:
Upon completion of the course the student shall be able to
- Know the various types of application of computers in pharmacy.
- Know the various types of databases.
- Know the various applications of databases in pharmacy.

UNIT I
Number system: 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.

UNIT II
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

UNIT III
Application of computers in Pharmacy – 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
Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

UNIT IV
Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

UNIT V
Computers as data analysis in Preclinical development: Chromatographic dada analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS)

Recommended books (Latest edition):
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 –
3. Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
4. Bioinformatics (Concept, Skills and Applications) – S.C. Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

5. 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, Daryagani, New Delhi – 110002

Reference Books:

1. Bryon S. Gottfried: McGraw Hill Book Co. (Schaum's Series) Programming with C.
2. E. Balagumswamy: Tata McGraw Hill Publishing Co., Programming in C.
3. John Sheeley and Roger Hunt: Computer Studies, First Course, Delhi: A.K. Wheeler & Co 1986.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. II Semester

L	T	P	C
2	0	0	2

(23BP205T) ENVIRONMENTAL SCIENCECS

30 Hours

Scope: Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

Objectives: Upon completion of the course the student shall be able to

- Create awareness about environmental problems among learners.
- Impart basic knowledge about the environment and its allied problems.
- Develop an attitude of concern for the environment.
- Motivate learners to participate in environment protection and environment improvement.
- Acquire skills to help the concerned individuals in identifying and solving environmental problems.
- Strive to attain harmony with Nature.

UNIT I

Introduction to Environmental Studies and Natural Resources:

The multidisciplinary nature of environmental studies

Role of an individual in the conservation of natural resources

UNIT II

Natural Resources and Associated Problems:

a) 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.

UNIT III

Ecosystems and Their Types:

- Concept of an ecosystem
- Structure and function of an ecosystem
- Overview of ecosystem types
- Characteristics of different ecosystems

UNIT IV

Detailed Study of Ecosystems:

- Forest ecosystem and its components
- Grassland ecosystem and its features
- Desert ecosystem and challenges faced.
- Aquatic ecosystems: ponds, streams, lakes, rivers, oceans, estuaries

UNIT V

Environmental Pollution: Air pollution; Water pollution; Soil pollution

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

Recommended Books (Latest edition):

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 Pu blishing 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.
8. Down of Earth, Centre for Science and Environment

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. II Semester

L	T	P	C
3	0	0	3

(23BP206T) SOCIAL AND PREVENTIVE PHARMACY

45 Hours

Scope: The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health programs. The roles of the pharmacist in these contexts are also discussed.

Objectives: After the successful completion of this course, the student shall be able to

- Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide.
- Have a critical way of thinking based on current healthcare development.
- Evaluate alternative ways of solving problems related to healing it and pharmaceutical issues.

UNIT I

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: Sociocultural 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

UNIT II

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

UNIT III

National health programs, its objectives, functioning and outcome of the following: HIV AND AIDS control program, TB, Integrated disease surveillance program (IDSP), National leprosy control program, National mental health program, Nationalprogram for prevention and control of deafness, Universal immunization program, National program for control of blindness, Pulse polio program.

UNIT IV

National health intervention program for mother and child, National family welfare program, National tobacco control program, National Malaria Prevention Program, National program for the health care for the elderly, social health program; role of WHO in Indian national program

UNIT V

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.

Recommended Books (Latest edition):

1. 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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

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

Recommended Journals:

1. Research in Social and Administrative Pharmacy, Elsevier, Ireland

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. II Semester

L	T	P	C
0	0	3	1.5

(23BP201P) HUMAN ANATOMY AND PHYSIOLOGY – II LAB

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

1. To study the integumentary and special senses using specimen, models, etc.,
2. To study the nervous system using specimen, models, etc.,
3. To study the endocrine system using specimen, models, etc
4. To demonstrate the general neurological examination
5. To demonstrate the function of olfactory nerve
6. To examine the different types of taste.
7. To demonstrate the visual acuity
8. To demonstrate the reflex activity
9. Recording of body temperature
10. To demonstrate positive and negative feedback mechanism.
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 analyzer
16. Permanent slides of vital organs and gonads.

Recommended Books: (Latest Edition)

1. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
2. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. II Semester

L	T	P	C
0	0	3	1.5

(23BP202P) PHARMACEUTICAL ORGANIC CHEMISTRY – I LAB

1. Systematic qualitative analysis of unknown organic compounds like
   a. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
   b. Detection of elementslike 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 analysed systematically.
2. Preparation of suitable solid derivatives from organic compounds
3. Construction of molecular models

Recommended Books: (Latest Edition)

1. Practical Organic Chemistry by Mann and Saunders.
2. Vogel's textbook of Practical Organic Chemistry
3. Advanced Practical organic chemistry by N.K. Vishnoi.
4. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. II Semester

L	T	P	C
0	0	3	1.5

(23BP203P) BIOCHEISTRY LAB

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.

Recommended Books (Latest Editions)

1. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
2. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
3. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
4. Practical Biochemistry by Harold Varley.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Pharm. – I YEAR COURSE STRUCTURE & SYLLABUS

I Year B.Pharm. II Semester

L	T	P	C
0	0	3	1.5

(23BP204P) COMPUTER APPLICATIONS IN PHARMACY LAB

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create an 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

Recommended Books (Latest Editions)

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)

JAWAHRALAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. PHARMACY II YEAR COURSE STRUTURE AND SYLLABUS

II B. Pharm. I Semester

S.No.	Course Code	CourseName	Hours per week			Credits
			L	T	P	
1.	23BP301T	Pharmaceutical Organic Chemistry II– Theory	3	1	-	4
2.	23BP302T	Physical Pharmaceutics I–Theory	3	1	-	4
3.	23BP303T	Pharmaceutical Microbiology–Theory	3	1	-	4
4.	23BP304T	Pharmaceutical Engineering–Theory	3	-	-	3
5.	23BP305T	Pathophysiology –Theory	3	-	-	3
6.	23BP301P	Pharmaceutical Organic Chemistry II –Practical	-	-	3	1.5
7.	23BP302P	Physical Pharmaceutics I–Practical	-	-	3	1.5
8.	23BP303P	Pharmaceutical Microbiology–Practical	-	-	3	1.5
9.	23BP304P	Pharmaceutical Engineering–Practical	-	-	3	1.5
10.	23BP305	**Skill Oriented course - 1** Preparation of cosmetics (any five)	1	-	2	2
11.	23BP306	**Non-Credit Mandatory Course** Universal Human values and Professional ethics	3	-	-	-
		Total	19	3	14	26

II B. Pharm. II Semester

S.No.	Course Code	Course Name	Hours per week			Credits
			L	T	P	
1.	23BP401T	Medicinal Chemistry I–Theory	3	1	-	4
2.	23BP402T	Physical Pharmaceutics II–Theory	3	1	-	4
3.	23BP403T	Pharmacology I–Theory	3	1	-	4
4.	23BP404T	Pharmacognosy and Phytochemistry I–Theory	3	-	-	3
5.	23BP405T	Pharmaceutical Jurisprudence–Theory	3	-	-	3
6.	23BP401P	Medicinal Chemistry I–Practical	-	-	3	1.5
7.	23BP402P	Physical Pharmaceutics II–Practical	-	-	3	1.5
8.	23BP403P	Pharmacology I–Practical	-	-	3	1.5
9.	23BP404P	Pharmacognosy and Phytochemistry I–Practical	-	-	3	1.5
10.	23BP405	**Skill Oriented course-II** Synthesis of API drugs (minimum five)	1	-	2	2
		Total	16	3	14	26

Mandatory community service internship for 6 to 8 week duration during summer vacation

* For exit Diploma in pharmacy certificate candidate has to secure additional four credits from the following courses:

1. Pharmacotherapeutics 2 credits
2. Hospital and clinical Pharmacy 2 credits

OR

Any course offered by MOOCs / NPTEL/ Swayam/ college/ Govt. agencies equivalent to the above four credits, approved by JNTUA

3. Hospital Training not less than 500 Hrs mandatory

JAWAHRALAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. PHARMACY II YEAR COURSE STRUTURE AND SYLLABUS

II Year B.Pharm. I Semester

L	T	P	C
3	1	0	4

(23BP301T) PHARMACEUTICAL ORGANIC CHEMISTRY – II (Theory)

45Hours

Scope: This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.

Objectives: Upon completion of the course the student shall be able to
1. Write the structure, name and the type of isomerism of the organic compound
2. Write the reaction, name the reaction and orientation of reactions
3. Account for reactivity/stability of compounds,
4. Prepare organic compounds

Course Content: 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

UNIT I **10 Hours**

Benzene and its derivatives

A. Synthetic and other evidence in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule
B. Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedel-Crafts alkylation-reactivity, limitations, Friedel-Crafts acylation.
C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction
D. Structure and uses of DDT, Saccharin, BHC and Chloramine

UNIT II **10 Hour**

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

Reactions and synthetic importance:

Metal hydride reduction (NaBH4 and LiAlH4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement, Claisen-Schmidt condensation

UNIT III **08 Hours**

Polynuclear hydrocarbons:

A. Synthesis, reactions
B. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives

UNIT IV **07 Hours**

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

JAWAHRALAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. PHARMACY II YEAR COURSE STRUTURE AND SYLLABUS

UNIT-V **07 Hours**

Fats and Oils

A. Fatty acids – reactions.
B. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.
C. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.

Recommended Books (Latest Editions)

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. Heterocyclic Chemistry by T.L. Gilchrist
10. Heterocyclic Chemistry by Raj K. Bansal

Reference Books:

1. Louden M., Organic Chemistry, 5 th edition, Roberts and Company Publishers, 2009.
2. Carey F., Organic Chemistry, 9 th edition, McGraw-Hill Education, 2013.
3. Corey E.J.,Logic of Chemical Synthesis, Wiley-Blackwell; Revised ed., 1995.

JAWAHRALAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. PHARMACY II YEAR COURSE STRUTURE AND SYLLABUS

II Year B.Pharm. I Semester

L	T	P	C
3	1	0	4

(23BP302T) PHYSICAL PHARMACEUTICS – I (Theory)

45Hours

Scope: The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives:

Upon the completion of the course student shall be able to

1.Understand various physicochemical properties of drug molecules in the designing the dosage forms

2.Know the principles of chemical kinetics & to use them for stability testing nad determination of expiry date of formulations

3.Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I **10 Hours**

Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications

UNIT-II **10Hours**

States of Matter and properties of matter: 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 & polymorphism.

Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications

UNIT-III **08 Hours**

Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilization, detergency, adsorption at solid interface.

UNIT-IV **08Hours**

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.

UNIT-V **07 Hours**

P^H, 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.

JAWAHRALAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. PHARMACY II YEAR COURSE STRUTURE AND SYLLABUS

Recommended Books: (Latest Editions)

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 ManavalanR.
8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee
9. Physical Pharmaceutics by C.V.S. Subramanyam
10. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar

Reference Books:

1. A.T. Florence and D. Attwood W: Physiochemical principles of Pharmacy.
2. Shotton and Ridgeway: Physical Pharmaceutics.
3. Remingtons Pharmaceutical Sciences, Mark Publishing Co.
4. H.S. Beans, A.H. Beckett and J.E. Carless: Advances in Pharmaceutical Sciences, Vol. 1 to 4.
5. S.P.Agarwal, Rajesh Khanna: Physical Pharmacy, CBS Publishers, New Delhi.

JAWAHRALAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. PHARMACY II YEAR COURSE STRUTURE AND SYLLABUS

II Year B.Pharm. I Semester

L	T	P	C
3	1	0	4

(23BP303T) PHARMACEUTICAL MICROBIOLOGY – (Theory)

45Hours

Scope: Study of all categories of microorganism's especially for the production of alcohol antibiotics, vaccines, vitamins enzymes etc.

Objectives:

Upon completion of the subject student shall be able to;

1. Understand methods of identification, cultivation and preservation of various microorganisms
2. To understand the importance and implementation of sterilization in pharmaceutical processing and industry
3. Learn sterility testing of pharmaceutical products.
4. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

Course content:

Unit I **10 Hours**

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 & viable count).

Study of different types of phase constrast microscopy, dark field microscopy and electron microscopy.

Unit II **10 Hours**

Identification of bacteria using staining techniques (simple, Gram's &Acid-fast staining) and biochemical tests (IMViC).

Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous,radiation and mechanical method of sterilization.

Evaluation of the efficiency of sterilization methods.

Equipment's employed in large scale sterilization. Sterility indicators.

Unit III **10 Hours**

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses.

Classification and mode of action of disinfectants

Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions

Evaluation of bactericidal & Bacteriostatic.

Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

Unit IV **08 Hours**

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

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B. PHARMACY II YEAR COURSE STRUTURE AND SYLLABUS

Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids.
Assessment of a new antibiotic.

Unit V **07Hours**

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.

Recommended Books (Latest edition)

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. Probisher, 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 : Text Book 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

Reference Books:

1. McNeil, Brian, and Linda M. Harvey. Practical fermentation technology. Chichester: Wiley, 2008.
2. Pharmacopoeias: IP,BP,USP,EP

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II Year B.Pharm. I Semester

L	T	P	C
3	0	0	3

(23BP304T) PHARMACEUTICAL ENGINEERING – (Theory)

45Hours

Scope: This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

Objectives: Upon completion of the course student shall be able:
1. To know various unit operations used in pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in pharmaceutical industries.

Course content:

UNIT-I **10 Hours**

Flow of fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.

Size Reduction: 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.

Size Separation: Objectives, applications & 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 & elutriation tank.

UNIT-II **10 Hours**

Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.

Evaporation: Objectives, applications 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.

Distillation: Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

UNIT- III **08 Hours**

Drying: Objectives, applications & mechanism of drying process, measurements & 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.

Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silvers on Emulsifier,

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UNIT-IV **08 Hours**

Filtration: Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seitz filter.

Centrifugation: Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

UNIT- V **07 Hours**

Materials of pharmaceutical plant construction, Corrosion and its prevention: 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, basic of material handling systems.

Recommended Books: (Latest Editions)

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 – Mcabe 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.

Reference Books:

1. J.F. Richardson and J.M. Coulron: Chemical Engineering
2. Perry: Handbook of Chemical Engineering
3. Lauer & Heckmann: Chemical Engineering Techniques
4. Peters: Elementary Chemical Engineering

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II Year B.Pharm. I Semester

L	T	P	C
3	0	0	3

(23BP305T) PATHOPHYSIOLOGY – (Theory)

45Hours

Scope: Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes. This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Objectives: Upon completion of the subject student shall be able to –
1. Describe the etiology and pathogenesis of the selected disease states;
2. Name the signs and symptoms of the diseases; and
3. Mention the complications of the diseases.

Course content:

Unit I **10Hours**

Basic principles of Cell injury and Adaptation:
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, Enzymeleakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance

Basic mechanism involved in the process of inflammation and repair:
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

Unit II **10Hours**

Cardiovascular System:
Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis)
Respiratory system: Asthma, Chronic obstructive airways diseases.
Renal system: Acute and chronic renal failure

Unit III **10Hours**

Hematological Diseases: Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalassemia, hereditary acquired anemia, hemophilia
Endocrine system: Diabetes, thyroid diseases, disorders of sex hormones
Nervous system: Epilepsy, Parkinson's disease, stroke,
Psychiatric disorders: Depression, Schizophrenia and Alzheimer's disease.
Gastrointestinal system: Peptic Ulcer

Unit IV **8 Hours**

Inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease.
Disease of bones and joints: Rheumatoid arthritis, osteoporosis and gout
Principles of cancer: classification, etiology and pathogenesis of cancer

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Unit V **7 Hours**

Infectious diseases: Meningitis, Typhoid, Leprosy, Tuberculosis Urinary tract infections
Sexually transmitted diseases: AIDS, Syphilis, Gonorrhea

Recommended Books (Latest Editions)

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.
4. 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;
5. William and Wilkins, Baltimore;1991 [1990 printing].
6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston;Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010.
8. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.
10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

Recommended Journals

1. The Journal of Pathology. ISSN: 1096-9896 (Online)
2. The American Journal of Pathology. ISSN: 0002-9440
3. Pathology. 1465-3931 (Online)
4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology. ISSN-0377-4929.

Reference Books:

1. Kulkarni, Shrinivas Krishnarao. Hand book of experimental pharmacology. 3rd edition, Vallabh prakashan, 1999.
2. R.K.Goyal, Practicals in Pharmacology, 6th,edition, B.S.ShahPrakashan, Ahmedabad, 2006-2007
3. U.K.Seth, N.K.Dadkar, Usha G.Kamat, Selected Topics in Experimental Pharmacology, 1st edition, Kothari Book Depot Mumbai, 1972
4. Ghosh M.N, Fundamentals of Experimental Pharmacology, 3rd edition, Hilton and Co, Kolkata, 2005

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II Year B.Pharm. I Semester

L	T	P	C
0	0	3	1.5

(23BP301P) PHARMACEUTICAL ORGANIC CHEISTRY – II (Practical)

3 Hours/week

I Experiments involving laboratory techniques

1. Recrystallization
2. Steam distillation

II Determination of following oil values (including standardization of reagents)

1. Acid value
2. Saponification value
3. Iodine value

III Preparation of compounds

1. Benzanilide/ Phenylbenzoate/ Acetanilide from Aniline/Phenol
2. /Aniline by acylation reaction.
3. 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/
4. Acetanilide by halogenation (Bromination) reaction.
5. 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
6. Benzoic acid from Benzyl chloride by oxidation reaction.
7. Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
8. 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions.
9. Benzil from Benzoin by oxidation reaction.
10. Dibenzyl acetone from Benzaldehyde by Claison Schmidt reaction
11. Cinnammic acid from Benzaldehyde by Perkin reaction
12. P-Iodo benzoic acid from P-amino benzoic acid

Reference books

1. Practical Organic Chemistry by Mann and Saunders.
2. Vogel's text book of Practical Organic Chemistry
3. Advanced Practical organic chemistry by N.K.Vishnoi.

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II Year B.Pharm. I Semester

L	T	P	C
0	0	3	1.5

(23BP302P) PHYSICAL PHARMACEUTICS – I (Practical)

3 Hours/week

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl4 and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and drop weight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
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

Reference Books

1. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee
2. Experimental Pharmaceutics by Eugene, Parott.

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II Year B.Pharm. I Semester

L	T	P	C
0	0	3	1.5

(23BP303P) PHARMACEUTICAL MICROBIOLOGY – (Practical)

3 Hours/week

1. Introduction and study of different equipment's 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, Gram's 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.

Reference Books

1. McNeil, Brian, and Linda M. Harvey. Practical fermentation technology. Chichester: Wiley, 2008.
2. Pharmacopoeias: IP, BP, USP, EP

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II Year B.Pharm. I Semester

L	T	P	C
0	0	3	1.5

(23BP304P) PHARMACEUTICAL ENGINEERING – (Practical)

3 Hours/week

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 –use of 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.

Reference Books

1. Remington practice of pharmacy- Martin, Latest edition.
2. Theory and practice of industrial pharmacy by Lachmann., Latest edition.

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B. PHARMACY II YEAR COURSE STRUTURE AND SYLLABUS

II Year B.Pharm. I Semester

L	T	P	C
1	0	2	2

(23BP305) PREPARATION OF COSMETICS (ANY FIVE)

Scope: This subject is designed to impart fundamental knowledge on the preparation of cosmetics. The subject enhace the skills in preparation of cosmetic formulation. The subject also emphasizes regulatory guidelnes on cosmetics.

Upon successful completion of this course, the student should be able to:
CO 1: Understand and Apply of Cosmetic Science Principles
CO 2: Develop skill in Cosmetic Formulation Techniques
CO 3: Adhere to Safety, Regulatory Compliance, and Ethical Considerations in cosmetics.

PREPARATION OF COSMETICS (ANY FIVE)

1. Preparation of Cold Cream
2. Preparation of Calamine lotion
3. Preparation of Tooth powder
4. Preparation of lipsticks
5. Preparation of shampoo
6. Preparation of Sun screen cream
7. Preparation Prefumed Talcum Powder
8. Preparation of Face wash
9. Preparation of Herbal hair oil
10. Preparation of Anti-aging Cream

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II Year B.Pharm. I Semester

L	T	P	C
3	0	0	0

(23BP306) UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS
(Non-Credit Mandatory Course)

Scope: This subject is designed to impart a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.

Objectives: Upon completion of the course the student shall be able to
1. To develop understanding of the concepts of Universal Human Values
2. To recognize the relevance of Universal Human Values
3. To develop understanding of value systems that are shared by our culture
4. To critically analyze current issues related to values
5. To develop a sense of personal self in harmony with society and nature through integration of Universal Human Values
6. To explore ways to integrate human values in personal and professional life

Course Content:
This course is intended to provide a much needed orientational input in value education to the young enquiring minds.

UNIT-1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education (9 Hours)
Understanding the Need, Basic Guidelines, Content and Process for Value Education, Self-Exploration–What is it? - its Content and Process; 'Natural Acceptance' and Experiential Validation- as the Mechanism for Self-Exploration, Continuous Happiness and Prosperity- A Look at Basic Human Aspirations, Right Understanding, Relationship and Physical Facilities- the Basic Requirements for Fulfillment of Aspirations of Every Human being with their Correct Priority, Understanding Happiness and Prosperity Correctly- A Critical Appraisal of the Current Scenario, Method to Fulfill the Above Human Aspirations: Understanding and Living in Harmony at Various Levels.

UNIT-II: Understanding Harmony in the Human Being - Harmony in Myself (9 Hours)
Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya

UNIT-III: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship (9 Hours)
Understanding Harmony in the Family- the Basic Unit of Human Interaction , Understanding Values in Human-Human Relationship; Meaning of Nyaya and Program for its Fulfillment to Ensure Ubhaytripti; Trust (Vishwas) and Respect (Samman) as the Foundational Values of Relationship, Understanding the Meaning of Vishwas; Difference between Intention and Competence, Understanding the Meaning of Samman, Difference between Respect and Differentiation; the Other

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Salient Values in Relationship, Understanding the Harmony in the Society (Society Being an Extension of Family): Samadhan, Samridhi, Abhay, Sah-Astitva as Comprehensive Human Goals, Visualizing a Universal Harmonious Order in Society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from Family to World Family!

UNIT-IV: Understanding Harmony in the Nature and Existence - Whole Existence as Coexistence (9 Hours)
Understanding the Harmony in the Nature, Interconnectedness and Mutual Fulfilment Among the Four Orders of Nature- Recyclability and Self-Regulation in Nature, Understanding Existence as Coexistence (Sah-Astitva) of Mutually Interacting Units in All-Pervasive Space, Holistic Perception of Harmony at All Levels of Existence.

UNIT-V: Implications of the above Holistic Understanding of Harmony on Professional Ethics (9 Hours)
Natural Acceptance of Human Values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to Utilize the Professional Competence for Augmenting Universal Human Order, b) Ability to Identify the Scope and Characteristics of People-Friendly and Eco-Friendly Production Systems, Technologies and Management Models, Case Studies of Typical Holistic Technologies, Management Models and Production Systems, Strategy for Transition from the Present State to Universal Human Order: a) At the level of Individual: as Socially and Ecologically Responsible Engineers, Technologists and Managers, b) At the Level of Society: as Mutually Enriching Institutions and Organisations.

Recommended Books (Latest Editions)

1. Dr R. R. Gaur, Sh. Rajul Asthana, Sh G.P. Bagaria, A textbook of Human Values and Professional Ethics, Excel books, New Delhi.
2. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excelbooks, New Delhi, 2010, ISBN 978-8-174-46781-2.
3. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010.
4. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted2008.
5. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.

Reference Books:

1. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991.
2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA.
3. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to
Growth, Club of Rome's Report, Universe Books.
4. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.

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B. PHARMACY II YEAR COURSE STRUTURE AND SYLLABUS

II Year B.Pharm. II Semester

L	T	P	C
3	1	0	4

(23BP401T) MEDICINAL CHEMISTRY – I (Theory)

60 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Objectives: Upon completion of the course the student shall be able to

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship (SAR) of different class of drugs
4. Write the chemical synthesis of some drugs

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 (*)

UNIT- I **10 Hours**

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

Drug metabolism principles- Phase I and Phase II.

Factors affecting drug metabolism including stereo chemical aspects.

UNIT- II **10 Hours**

Drugs acting on Autonomic Nervous System Adrenergic Neurotransmitters:

Biosynthesis and catabolism of catecholamine.

Adrenergic receptors (Alpha & Beta) and their distribution.

Sympathomimetic agents: SAR of Sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine,

Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

Indirectactingagents: Hydroxy amphetamine,Pseudoephedrine, Propylhexedrine.

Agents with mixed mechanism: Ephedrine, Metaraminol.

Adrenergic Antagonists:Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

UNIT-III **10 Hours**

Cholinergic neurotransmitters.

Biosynthesis and catabolism of acetylcholine.

Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

Parasympathomimetic agents: SAR of Parasympathomimetic agents

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Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine.
Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathione, Malathion.
Cholinesterase reactivator: Pralidoxime chloride.
Cholinergic Blocking agents: SAR of cholinolytic agents
Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*.
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.

UNIT- IV **10 Hours**

Drugs acting on Central Nervous System

A.Sedatives and Hypnotics:

Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

Barbiturtes: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butabarbital, Pentobarbital, Secobarbital

Miscelleneous:

Amides &imides: Glutethmide.

Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

B.Antipsychotics

Phenothiazeines: SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.

Ring Analogues of Phenothiazeines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

Fluro buterophenones: Haloperidol, Droperidol, Risperidone.

Beta amino ketones: Molindone hydrochloride.

Benzamides: Sulpieride.

C.Anticonvulsants: SAR of Anticonvulsants, mechanism of anticonvulsant action

Barbiturates: Phenobarbitone, Methabarbital.

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

UNIT – V **10 Hours**

Drugs acting on Central Nervous System

General anesthetics

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride*.

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

Narcotic antagonists: Nalorphine hydrochloride, Levallorphantartarate, Naloxone hydrochloride.

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Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

Recommended Books (Latest Editions)

1. Wilson and Giswold'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. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

Reference Books:

1. R.T. Morrison and R.N. Boyd: Organic Chemistry, Allyn and Bacon Inc., Boston (USA).
2. I.L. Finar: Organic Chemistry, Vol. I & II, ELBS and Longman Group Ltd., London.
3. L.M. Atherden: Bentley and Driver's-Textbookof Pharmaceutical Chemistry, Oxford University Press, Delhi

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II Year B.Pharm. II Semester

L	T	P	C
3	1	0	4

(23BP402T) PHYSICAL PHARMACECUTICS – II (Theory)

60 Hours

Scope: The course deals with the various physical and physicochemical properties, and principals involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives: Upon the completion of the course student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing nad determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I 10 Hours

Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization& protective action.

UNIT-II 10 Hours

Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers

Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

UNIT-III 10 Hours

Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and 0theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.

UNIT-IV 10Hours

Micromeritics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for 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 & flow properties.

UNIT-V 10 Hours

Drug stability: Reaction kinetics: zero, pseudo-zero, first & 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 & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common

reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

Recommended Books: (Latest Editions)

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.

Reference Books:

1. A.T. Florence and D. Attwood W: Physiochemical principles of Pharmacy.
2. Shotton and Ridgeway: Physical Pharmaceutics.
3. Remingtons Pharmaceutical Sciences, Mark Publishing Co.
4. H.S. Beans, A.H. Beckett and J.E. Carless: Advances in Pharmaceutical Sciences, Vol. 1 to 4.
5. S.P.Agarwal, Rajesh Khanna: Physical Pharmacy, CBS Publishers, New Delhi.

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II Year B.Pharm. II Semester

L	T	P	C
3	1	0	4

(23BP403T) PHARMACOLOGY – I (Theory)

60 Hours

Scope: The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

Objectives: Upon completion of this course the student should be able to
1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences

Course Content:

UNIT-I **08 hours**

1.General Pharmacology

a. 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.

b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs. Enzyme induction, enzyme inhibition, kinetics of elimination

UNIT-II **12 Hours**

c. 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.

d. Adverse drug reactions.

e. Drug interactions (pharmacokinetic and pharmacodynamic)

f. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

UNIT-III **10 Hours**

2. Pharmacology of drugs acting on peripheral nervous system

a. Organization and function of ANS.
b. Neurohumoral transmission, co-transmission and classification of neurotransmitters.
c. Para sympathomimetics, Parasympatholytic, Sympathomimetics, sympatholytic.
d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).
e. Local anesthetic agents.
f. Drugs used in myasthenia gravis and glaucoma

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UNIT-IV **10 Hours**

3. Pharmacology of drugs acting on central nervous system

a. Neurohumoral transmission in the C.N.S.special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.
b. General anesthetics and pre-anesthetics.
c. Sedatives, hypnotics and centrally acting muscle relaxants.
d. Anti-epileptics
e. Alcohols and disulfiram

UNIT-V **10 Hours**

3. Pharmacology of drugs acting on central nervous system
f. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.
g. Drugs used in Parkinsons disease and Alzheimer's disease.
h. CNS stimulants and nootropics.
i. Opioid analgesics and antagonists
j. Drug addiction, drug abuse, tolerance and dependence.

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology,.Churchil 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,

Reference Books:

1. Lippincott's Illustrated Reviews, Pharmacology 6th edition, Wolters Kluwer, 2015
2. R.S. Satoskar, S.D. Bhandarkar, Pharmacology and Pharmacotherapeutics 24th Edition, 2015
3. F.S.K. Barar, Essentials of Pharmacotherapeutics 1st edition, S. Chand and Company Ltd, 2004

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II Year B.Pharm. II Semester

L	T	P	C
3	0	0	3

(23BP404T) PHARMACOGNOSY AND PHYTOCHEMISTRY – I (Theory)

45Hours

Scope: The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

Objectives: Upon completion of the course, the student shall be able
1. To know the techniques in the cultivation and production of crude drugs
2. To know the crude drugs, their uses and chemical nature
3. Know the evaluation techniques for the herbal drugs
4. To carry out the microscopic and morphological evaluation of crude drugs

Course Content:

UNIT-I **10 Hours**

Introduction to Pharmacognosy:

(a) Definition, history, scope and development of Pharmacognosy
(b) Sources of Drugs – Plants, Animals, Marine & Tissue culture
(c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.
Quantitative microscopy of crude drugs including lycopodium spore method, leafconstants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

UNIT-II **10 Hours**

Cultivation, Collection, Processing and storage of drugs of natural origin:

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

Conservation of medicinal plants

UNIT-III **07 Hours**

Plant tissue culture:

Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.
Applications of plant tissue culture in pharmacognosy. Edible vaccines

UNIT IV **10 Hours**

Pharmacognosy in various systems of medicine:

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.
Introduction to secondary metabolites:
Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids,

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Tannins, Volatile oil and Resins

UNIT V **08 Hours**

Study of biological source, chemical nature and uses of drugs of natural origin containing following 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, serrati peptidase, urokinase, streptokinase, pepsin).

Lipids (Waxes, fats, fixed oils): Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax

Marine Drugs:

Novel medicinal agents from marine sources

Recommended Books: (Latest Editions)

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. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), IstEdn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

Reference Books:

1. Dewick, Paul M. Medicinal natural products: a biosynthetic approach. 2nd edition, John Wiley &Sons, 2002
2. Bruneton J, Pharmacognosy & Phytochemistry Medicinal Plants,2nd edition, Lavoisier Publishing Inc. 1999
3. Harborne J.B. Phytochemical Methods- A Guide to modern techniques of Plant analysis, 3rd edition, Springer, 1998
4. Ikan R., Natural Products- A Laboratory Guide, 2nd edition, Academic Press, 1994

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II Year B.Pharm. II Semester

L	T	P	C
3	0	0	3

(23BP405T) PHARMACEUTICAL JURISPRUDENCE – I (Theory)

45Hours

Scope: This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India

Objectives: Upon completion of the course, the student shall be able to understand:

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

Course Content:

UNIT-I **8 Hours**

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.

UNIT-II **10 Hours**

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 & DMR (OA) Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling &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

UNIT-III **10 Hours**

•**Pharmacy Act –1948:** Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties

•**Medicinal and Toilet Preparation Act –1955:** Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.

•**Narcotic Drugs and Psychotropic substances Act-1985 and Rules:** Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & 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

UNIT-IV **09 Hours**

•**Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties

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•**Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for 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

•**National Pharmaceutical Pricing Authority:** 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)

UNIT-V **08 Hours**

•**Pharmaceutical Legislations –** A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee

•**Code of Pharmaceutical ethics** Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath

•Medical Termination of Pregnancy Act

•Right to Information Act

•Introduction to Intellectual Property Rights (IPR)

Recommended books: (Latest Edition)

1. Forensic Pharmacy by B. Suresh
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:

1. N. K. Jain: Pharmaceutical Jurisprudence
2. S. P. Aggarwal and R. Khanna: Pharmaceutical Jurisprudence, Tata Publishers.

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II Year B.Pharm. II Semester

L	T	P	C
0	0	3	1.5

(23BP401P) MEDICINAL CHEISTRY – I (Practical)

3 Hours/week

I. Preparation of drugs/ intermediates

1. 1,3-pyrazole
2. 1,3-oxazole
3. Benzimidazole
4. Benztriazole
5. 2,3- diphenyl quinoxaline
6. Benzocaine
7. Phenytoin
8. Phenothiazine
9. Barbiturate

II. Assay of drugs

1. Chlorpromazine
2. Phenobarbitone
3. Atropine
4. Ibuprofen
5. Aspirin
6. Furosemide

III. Determination of Partition coefficient for any two drugs

Recommended Books (Latest Editions)

1. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
2. Indian Pharmacopoeia.
3. Text book of practical organic chemistry- A.I.Vogel

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II Year B.Pharm. II Semester

L	T	P	C
0	0	3	1.5

(23BP402P) PHYSICAL PHARMACEUTICS – II (Practical)

3 Hours/week

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using microscopic method
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
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 agent
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

Recommended Books (Latest Editions)

1. Experimental pharmaceutics by Eugene, Parott.
2. Physical Pharmacy by Alfred Martin, Sixth edition

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B. PHARMACY II YEAR COURSE STRUTURE AND SYLLABUS

II Year B.Pharm. II Semester

L	T	P	C
0	0	3	1.5

(23BP403P) PHARMACOLOGY – I (Practical)

3 Hours/week

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 esophagus
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

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by software's and videos

Recommended Books (Latest Editions)

1. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
2. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan

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II Year B.Pharm. II Semester

L	T	P	C
0	0	3	1.5

(23BP404P) PHARMACOGNOSY AND PHYTOCHEMISTRY – I (Practical)

3 Hours/week

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

Recommended Books (Latest Editions)

1. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
2. Anatomy of Crude Drugs by M.A. Iyengar.

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B. PHARMACY II YEAR COURSE STRUTURE AND SYLLABUS

II Year B.Pharm. II Semester

L	T	P	C
1	0	2	2

(23BP405) SYNTHESIS OF API DRUGS (MINIMUM FIVE)
(Skill Oriented Course – II)

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under different classes. This skill will enhance the ability of student to synthesis new chemical entities.

Course outcomes: Upon successful completion of this course the student should be able to:
1. Understand fundamental principles of synthetic organic chemistry for synthesizing APIs, including reaction mechanisms and stereochemistry
2. Analyse and predict the outcomes of key synthetic reactions commonly used in API synthesis, such as acetylation, alkylation, esterification, and amylation.
3. Understand the influence of molecular structure on chemical reactivity in API synthesis

SYNTHESIS OF API DRUGS (MINIMUM FIVE)

1. Synthesis of Non-Steroidal Anti-Inflammatory Drugs
2. Synthesis of Anti-convulsant drugs
3. Synthesis of Sedatives and Hypnotics
4. Synthesis of Anto-pyrine
5. Synthesis ofChlorobutanol
6. Synthesis of 7 hydroxy 4 methyl coumarin
7. Synthesis ofSulphonamides
8. Synthesis of Amines
9. Synthesis of Anti-bacterial
10. Synthesis of Anti-psychotic