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MOHAN BABU UNIVERSITY

Sree Sainath Nagar, Tirupati – 517 102

MB SCHOOL OF PHARMACEUTICAL SCIENCES

Pharm.D

MBU23 Academic Regulations and Curriculum

(Version 1.0)

(Academic Regulations are applicable to Pharm.D and Pharm.D(PB) Programs offered by MB School of Pharmaceutical Sciences in MBU from 2023-24 onwards)

MOHAN BABU UNIVERSITY

Vision

To be a globally respected institution with an innovative and entrepreneurial culture that offers transformative education to advance sustainability and societal good.

Mission

- Develop industry-focused professionals with a global perspective.
- Offer academic programs that provide transformative learning experiencefounded on the spirit of curiosity, innovation, and integrity.
- Create confluence of research, innovation, and ideation to bring about sustainable and socially relevant enterprises.
- Uphold high standards of professional ethics leading to harmonious relationship with environment and society.

MB SCHOOL OF PHARMACEUTICAL SCIENCES

Vision

To be a global leader in the field of Pharmaceutical Education and Health Care Management by providing Quality Education, Training, Research and Entrepreneurial Ecosystem.

Mission

- Developing competencies and skills to solve problems in the field of Pharmaceutical Sciences through contemporary Curriculum and congenial learning environment.
- Imbibing ethics and values in students for effective Pharmaceutical practice through curricular, co-curricular and extra-curricular activities.
- Encourage faculty and staff to excel in their respective fields and demonstrate the best of their abilities by way of continuing education, research and consultancy.

PROGRAM EDUCATIONAL OBJECTIVES

After few years of graduation, the graduates of Pharm. D will:

PEO1. Promulgate the compendious Pharm. D (PB) program with professional knowledge, skills, research and competencies to work in all the domains of pharmaceutical sciences

PEO2. Provide students with Knowledge and abilities to deliver pharmaceutical care in all clinical settings.

PEO3. Develop creative thinking in clinical pharmacy services and encourage adaptation to changing patterns in medical research.

PEO4. Instigate experiential learning practices and hands on training in advanced clinical pharmacy practice services.

PROGRAM OUTCOMES

On successful completion of the Program, the graduates of Pharm.D Program will be able to:

PO1. Apply the **knowledge** of pharmaceutical sciences and practice in providing solution of complex clinical pharmacy practice and pharmaceutical care.

PO2. Apply knowledge and skills to **analyze** day-to-day professional needs of the health care by serving hospital, community and industrial needs.

PO3. Design **solutions** in patient care area and clinical drug development by applying skills developed during pharmacy education.

PO4. Utilize research-based knowledge and research methods for **complex problems** by experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Utilize appropriate techniques, resources, and modern pharmaceutical and IT **tools** including drug information database, statistical analysis, PK/PD modeling prediction and bioinformatics modeling.

PO6. Create awareness regarding **societal,** health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Clinical pharmacy practice.

PO7. Understand the impact of the professional pharmaceutical solutions in societal and **environmental** contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Apply **ethical** principles and commit to professional ethics and responsibilities and norms of the clinical Pharmacy practice.

PO9. Function **effectively** as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communicate** effectively on complex clinical problems with the pharmacy communicate and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Demonstrate knowledge and understanding of the **project and financial management** principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Recognize the need for, and have the preparation and ability to engage in independent and **life-long learning** in the broadest context of modern medical sciences.

PROGRAM SPECIFIC OUTCOMES

On successful completion of the Program, the graduates of Pharm.D Program will be able to:

PSO 1. Acquire knowledge in the field of synthetic and natural sources of drugs with their chemistries as well as formulation and evaluation including their regulatory requirements.

PSO 2. Understand the fundamentals in physiology, anatomy, biochemistry, microbiology and pathophysiology understand pharmacotherapy and able to explain the pharmacological and toxicological aspects of various drugs.

PSO 3. Apply their expertise in pharmacovigilance, clinical research, pharmacoepidemiology and economics.

PSO 4. Comprehend the role of pharmaceutical care concepts of hospital, community and clinical pharmacy for serving the society.

1. Preamble

Modern era students would like to take decisions on their own and plan their future accordingly. Students would like to pursue education as per their pace. On other hand, employers expect multidisciplinary competency, leadership skills and computer literacy along with lifelong learning skills from the students. The conventional learning system has narrow scope with regard to flexibility in choosing courses of their choice to become a well-rounded personality. It is essential that the present education system should address this and provide wide opportunities for students to choose programs and courses of their interest in order to realize their full potential which in turn leads to the nation development. Further, natural resources are depleted globally at a faster rate. Hence, sustainable development has become the agenda for the complete world to preserve natural resources and environment for the sake of future generations. In addition, the world is embracing disruptive technologies to improve the quality of life. Also, students should be nurtured with skills on higher order cognitive capacities, research, innovation, incubation and entrepreneurship; life skills; social consciousness, inclusiveness, equality, culture, languages, literature, ethics and values; basic arts, crafts, humanities, games, sports and fitness.

In this context, Mohan Babu University has taken initiative and brought out Academic Regulations addressing Choice Based Credit System, sustainable development, disruptive technologies, rapid change in knowledge landscape, change in employment landscape, change in global ecosystem and other areas of national and international importance to change country's educational landscape and in turn country's landscape.

MBU23 Academic Regulations embrace Choice Based Credit System, project-based learning, enhanced practical component, etc.

2. Scope

The rules and regulations stated herein shall be called "MBU23 Academic Regulations" in its complete form. MBU23 academic regulations as given in this document are applicable to students admitted in PG Programs offered under MBU from the academic year 2023-24 onwards. All academic programs under MBU23 shall be decided by the Academic council. MBU23 is applicable for both existing as well as new programs offered by the MBU, until and unless it is explicitly stated.

3. Regulations for Pharm.D and Pharm.D (P.B) Programs offered under MBU

These regulations shall be called "The Regulations for the Pharm.D and Pharm.D(P.B) Degree Programs". They shall come into effect in the academic year 2023–24. The regulations framed are subject to modifications from time to time by Mohan Babu University (MBU) in line with the Pharmacy Council of India (PCI).

4. Definitions and Nomenclature

'***Degree***' means the academic award conferred upon a student on successful completion of any program of study designed to achieve the defined attributes.

'***Program***' means cohesive arrangement of courses, co-curricular and extracurricular activities to accomplish predetermined objectives leading to the awarding of a degree in a branch or discipline. Some Degree programs also provide options to specialize in a specific domain of interest in a branch or discipline.

'***Course***' means any combination of lecture, tutorial, practical and project-based learning sessions of a subject studied in a year, like Pharmaceutics, Pharmaceutical Analysis, Pharmacology and Pharmacognosy, Pharmacotherapeutics etc.

5. Admission

5.1 Number of Seats: The number of seats in Pharm.D and Pharm.D(P.B) programs for which admission is to be made will be decided by the Board of Management, MBU with approval from Pharmacy Council of India.

5.2 Nationality and Age:

Resident Indian or Non-Resident Indian (NRI), holder of PIO or OCI card issued by Government of India is eligible to apply for Selection Process.

Note: NRIs, holders of PIO or OCI card issued by Government of India must apply under international student category only.

Student should have attained the age of 17+ years on the 31st December of the year in which he/she is seeking admission in Pharm.D.

Student should have attained the age of 21+ years on the 31st December of the year in which he/she is seeking admission in Pharm.D(PB).

5.3.a. Eligibility Criteria for Pharm.D Program

A Pass in the following examinations

a) 10 + 2 examination with Physics and Chemistry as compulsory subjects along with either mathematics or Biology.

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

c) Any other qualification approved by Pharmacy Council of India as equivalent to any of the above examinations

5.3.b. Eligibility Criteria for Pharm.D (P.B) Program

A Pass in the following examinations

a) B. Pharm Degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India and has scored not less than 55 % of the maximum marks (aggregate of 4 years of B. Pharm)

b) Every student, selected for admission to post graduate pharmacy program in any PCI approved institution should have obtained registration with the State Pharmacy Council or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled.

Note: It is mandatory to submit a migration certificate obtained from the respective university where the candidate had passed his/her qualifying degree (Bachelor of Pharmacy)

Candidates with valid scores in National level entrance exams like GPAT, PGCET is eligible for direct admission in Pharm.D (P.B)

5.4 Authority for Admission: Any matter related to admission to any program, the decision of

the Admission Committee is final.

If, at any time after admission, it is found that a candidate has not fulfilled the requirements stipulated in the offer of admission, the concerned School Dean may revoke the admission of the candidate and report the matter to the Vice Chancellor.

In Addition to the above, admissions will be based on the rules and regulations of the UGC/Competent authorities in force at the time of admissions.

6. Academic System

6.1 Annual system

Pharm.D program offered by MB School of Pharmaceutical Sciences shall follow the year system. The Program is for 6 years (course work for five academic years and one-year internship).

Pharm.D(P.B) program offered by MB School of Pharmaceutical Sciences shall follow the year system. The Program is for 3 years (course work for two academic years and one-year internship).

6.2 Curriculum

The university Academic Regulations shall have 5-digit alpha-numeric representation that refers to University Name followed by last two digits of Calendar Year viz. MBU23 Regulations. Program Curriculum shall have the corresponding Academic Year representation. Students admitted into a program shall adopt a curriculum specified by the Academic Council for that academic year. Unless otherwise stated explicitly by the Academic Council, any curriculum changes will be applicable to the students admitted in the subsequent year and the existing batches continue to follow the curriculum prescribed at the time of their joining the program.

6.3 Course Classification

Courses may be classified as Theory, Practical, Project work, Clerkship and Internship.

6.4 Syllabus

The syllabus of a course provides what the student will learn in the course of study. Each course syllabus document contains course code, course title, L T P, course description, course outcomes, module-wise topics, duration to cover each module, text books, reference books, video lectures and web resources for additional learning.

6.5 Course Handout

A Course Handout consists of a detailed plan of lectures and its mode of delivery, List of Exercises/Experiential learning, Resources, Evaluation methods, Model Question paper and CO Attainment Targets.

7. Academic Calendar

The academic calendar includes the dates with regard to course registrations, spell of instructions, continuous internal assessment tests, year-end theory examinations, practical examinations and year holidays. The Registrar will communicate the Academic calendar to the Departments/ Schools, and the same will be available on the website. The dates and schedules in the academic calendar may change in specific programs due to regulatory and local requirements. In such cases, the concerned School Dean with prior authorization will communicate the changes to the

students. The revised academic calendar will also made available on the website.

8. Course Registration

Immediately after joining the University, each student shall be assigned a Mentor by the Department/School concerned. The mentor shall discuss with the student on their academic performance year-wise, periodically, and guide the student on nature and number of courses to be registered in the ensuing year, within the framework of that program curriculum.

- Through the course registration process, every year, it is mandatory for the students to register for the courses specified in the year as and when notified, with the approval of the mentor.
- Students shall not be permitted to register for the courses if the student has any outstanding dues to the University.

8.1 Arrear Examination:

- If a student failed in a course, then the student is allowed to register for arrear examinations as and when notified.
- If a student has backlog courses after completion of the program of study, a provision is given to clear the courses by appearing any number of arrear examinations upon the notifications within the stipulated program duration.

9. Attendance Requirements

- A student shall be eligible to appear for year-end examinations if he acquires a minimum of 80% of attendance in aggregate of all the courses in a year.
- Condonation of shortage of attendance in aggregate up to 10% (70% and above and below 80%) in each year may be granted by the School Dean.
- Shortage of attendance below 70% in aggregate shall in no case be condoned.
- Students whose shortage of attendance is not condoned in any year shall not be eligible to take their year-end examination and their registration shall stand cancelled.
- Student shall not be promoted to the next year unless he satisfies the attendance requirements of the year, as applicable. The student may seek readmission for the year when offered next. He will not be allowed to register for the courses of the year while he is in detention.
- Stipulated fee shall be payable to the university towards condonation of shortage of attendance.
- In the remaining 20% of attendance, the student shall manage medical/personnel/ casual/official absence for organizing events/ seminars/ workshops/ technical/ cultural festivals/ competitions/ participation in co- curricular/ extra-curricular events/NCC/NSS activities or any other reason. However, attendance shall be given at actuals for participating in NCC/NSS activities at National level.

10. Academic requirement for promotion/completion of program of study

For Pharm.D

- A student shall not be promoted from first year to second year of program of study if he/she failed more than two courses/subjects in first year program of study.
- A student shall not be promoted from second year to third year of program of study if he not PASS all the courses/ subjects pertaining to first year program of study and failed more than two courses/subjects of second year program of study.
- A student shall not be promoted from third year to fourth year of program of study if he not PASS all the courses/ subjects pertaining to second year program of study and failed more than two courses/subjects of third year program of study.
- A student shall not be promoted from fourth year to five year of program of study if he not PASS all the courses/ subjects pertaining to third year program of study and failed more than two courses/subjects of fourth year program of study.
- A student shall not be promoted from fifth year to sixth year of program of study if he not PASS all the courses/ subjects pertaining to fourth year program of study and failed more than two courses/subjects of fifth year program of study.
- The student shall register for all the courses as per the course structure. Marks obtained in all the courses shall be considered for the calculation of award of CLASS.

A student who fails in completion of all courses as per the course structure with in maximum duration of program of study then the admission shall forfeit his seat in the program of study and his/her admission stands cancelled.

For Pharm.D(PB)

- A student shall not be promoted from first year to second year of program of study if he/she failed more than two courses/subjects in first year program of study.
- A student shall not be promoted from second year to third year of program of study if he not PASS all the courses/ subjects pertaining to first year program of study and failed more than two courses/subjects of second year program of study.
- The student shall register for all the courses as per the course structure. Marks obtained in all the courses shall be considered for the calculation of award of CLASS.
- A student who fails in completion of all courses as per the course structure with in maximum duration of program of study then the admission shall forfeit his seat in the program of study and his/her admission stands cancelled.

11. Evaluation Criteria

11.1 Scheme of Evaluation

All components in any Program of Study shall be evaluated through Internal Evaluation and/or

Year End Evaluation.

<table>
<tr><th>Course Type</th><th>Marks</th><th colspan="2">Examination and Evaluation</th><th>Scheme of Examination</th></tr>
<tr><td rowspan="4">Theory</td><td rowspan="3">30</td><td>20</td><td>Mid Examination
(60 Minutes)</td><td>Three Mid Examinations each for 20 marks shall be conducted and average of best two among the three shall be considered for 20 Marks.
• The question paper for Mid-I, II & III shall be of descriptive type with two parts i.e., Part A and Part B
• Part A contains 6 short answer questions [(Q 1 (a) to (f)] out of which student shall answer 5 questions and each shall be evaluated for 2 marks
• Part B contains 2 descriptive questions [(Q 2 (a) to (b)] out of which student shall answer 1 question and the same shall be evaluated for 10 marks.</td></tr>
<tr><td>10</td><td>Continuous Assessment</td><td>The student shall be assessed based on the following parameters three times in a year.
• Attendance – Max. 4 Marks
<table>
<tr><th>Percentage of Attendance</th><th>Marks</th></tr>
<tr><td>95 – 100</td><td>4</td></tr>
<tr><td>90 – 94</td><td>3</td></tr>
<tr><td>85 – 89</td><td>2</td></tr>
<tr><td>80 – 84</td><td>1</td></tr>
<tr><td>Less than 80</td><td>0</td></tr>
</table>
• Academic activities – Max. 3 Marks
(Average of any 3 activities Eg. Quiz, Assignment, Open Book Test, Fieldwork, Group Discussion and Seminar)
• Student-Teacher interaction – Max. 3 Marks</td></tr>
<tr><td colspan="3">The internal marks are the sum of mid-exam marks and respective continuous assessment marks. Three internal examinations have to be conducted each for 30 marks, the average of the best two among the three internal examinations shall be the final marks.</td></tr>
<tr><td>70</td><td colspan="2">Year End Examination
(180 Minutes)</td><td>The examination shall be conducted for 70 marks

The question paper shall of descriptive type with two parts i.e., Part-A and Part-B.
Part-A shall contain 10 short answer questions [Q. No. 1 (a) to (j)] out of which student should be answering 8 question and each shall be evaluated for 5marks.

Part-B shall contain Four questions [totally Fourteen questions from Q. No. 2 to 5)] of which student has to answer 2 questions and each shall be evaluated for 15 marks.</td></tr>
</table>

Course Type	Marks	Examination and Evaluation		Scheme of Examination
Practical	30	05	Day-to-day Evaluation	Day-to-day evaluation based on the performance in the conduction of laboratory experiments and its records & Viva voce for 05 Marks

<table>
<tr><td rowspan="2"></td><td rowspan="2"></td><td>05</td><td>Attendance</td><td><table><tr><th>Percentage of Attendance</th><th>Marks</th></tr><tr><td>95 – 100</td><td>5</td></tr><tr><td>90 – 94</td><td>4</td></tr><tr><td>85 – 89</td><td>3</td></tr><tr><td>80 – 84</td><td>2</td></tr><tr><td>Less than 80</td><td>1</td></tr></table></td></tr>
<tr><td>20</td><td>Internal Examination
(240 Minutes)</td><td>• Two Internal Examinations each for 20 marks shall be conducted and the best among the two shall be considered for 20 marks.
• Evaluation shall be on the following parameters.
➢ Part A – Synopsis for 5 marks
➢ Part B – Major Experiment for 10 marks,
➢ Part C – Minor experiment for 3 marks
➢ Part D – Viva voce for 2 marks.
The distribution of marks may be altered as per the course requirement.</td></tr>
<tr><td></td><td>70</td><td colspan="2">Year End Examination
(240 Minutes)</td><td>• Evaluation shall be on the following parameters.
➢ Part A – Synopsis for 15 marks
➢ Part B – Major Experiment for 25 marks,
➢ Part C – Minor experiment for 15 marks
➢ Part D – Viva voce for 15 marks.
The distribution of marks may be altered as per the course requirement.</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td rowspan="2">Project Work</td><td>30</td><td colspan="2">Internal Examination</td><td>Write up of the seminar - 7.5 marks
Presentation of work (7.5)
Communication skills (7.5)
Question and answer skills (7.5)</td></tr>
<tr><td>70</td><td colspan="2">Year End Examination</td><td>Write up of the seminar (17.5)
Presentation of work (17.5)
Communication skills (17.5)
Question and answer skills (17.5)</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td rowspan="2">Clerkship</td><td>30</td><td colspan="2">Internal Examination</td><td rowspan="2">Detailed in Section 11.3</td></tr>
<tr><td>70</td><td colspan="2">Year End Examination</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>Internship</td><td>-</td><td colspan="2">Year End Evaluation</td><td>Detailed in Section 11.4</td></tr>
</table>

11.2 Project work

A Student has to take up and complete project work. He or she must identify the topic of project work, collect relevant literature, preliminary data, implementation tools/ methodologies, practical investigations, implementation, analysis of results, validation and report writing.

The student shall be allowed to develop data collection and reporting skills in the area of community, hospital and clinical pharmacy, a project work shall be carried out under the supervision of a faculty. The project topic must be approved by the Head of the Department or Head of the Institution. Project work shall be presented in a written report and as a seminar at the end of the year. External and the internal examiners shall do the assessment of the project work.

Internal Examination

A student has to present the progress of the Research Work to the Project Evaluation Committee (PEC). The performance of the student shall be evaluated on the basis of TWO reviews along with detailed discussions. Each review shall be conducted for a maximum of "30" marks. The average of two review marks shall be finalised for a maximum of 30 marks.

The Project Evaluation Committee (PEC) consisting of concerned supervisor and two senior faculty members shall monitor the progress of the project work of the student. The PEC is constituted by the respective School Dean on the recommendations of the Head of the Department

Year End Examination

The Year-end examination shall be conducted by a Committee consisting of an External Examiner, HOD and concerned Supervisor. If required, multiple committees shall be constituted for multiple sections with prior approval. The External Examiner shall be nominated by the respective School Dean from the panel of Examiners submitted by the Department.

- The Thesis report shall be made plagiarism check and the report only with less than 20% shall be accepted.
- It is mandatory that every student has to publish/submit acceptance letter of a paper in a peer reviewed Journal or Conference before year End Examinations. Otherwise, the student is not eligible for submission of thesis report.
- If the report of the examiner is not favourable, the dissertation should be revised and resubmitted after a minimum period of three months.
- The students who fail in Project work Viva-Voce examination shall have to re-appear for the Viva-Voce examination after three months.
- Extension of time for completing the project is to be obtained from the Chairman, Academic Council, MBU.

11.3. Clerkship

The student shall collect the Patient case records from various departments viz, General Medicine, General Surgery, Pediatrics, Psychiatry etc., of the designated hospital during second year of program of study.

Internal Examination

A student has to present the report on the above to the Clerkship Evaluation Committee (CEC). The performance of the student shall be evaluated on the basis of TWO reviews along with detailed discussions. Each review shall be conducted for a maximum of "30" marks. The average of two review marks shall be finalised for a maximum of 30 marks.

Year End Examination

The Year-end examination shall be conducted by a Committee consisting of an External Examiner, HOD and concerned Supervisor. If required, multiple committees shall be constituted for multiple sections with prior approval. The External Examiner shall be nominated by the respective School Dean from the panel of Examiners submitted by the Department.

11.4 Internship

1. Internship is a phase of training wherein a student is expected to conduct actual practice of pharmacy and health care and acquires skills under the supervision so that he or she may become capable of functioning independently.

2. Every student has to undergo 12 months internship (Full third year of program of study).

3. Other details:

i) All parts of the internship shall be done, as far as possible, in institutions in India. In case of any difficulties, the matter may be referred to the Pharmacy Council of India to be considered on merits.

ii) Where an intern is posted to district hospital for training, there shall be a committee consisting of representatives of the university, and the district hospital administration, who shall regulate the training of such trainee. For such trainee a certificate of satisfactory completion of training shall be obtained from the relevant administrative authorities which shall be countersigned by the Dean of the School.

iii) Every candidate shall be required to undergo internship during the last year of study for the satisfaction of the University concerned for a period of twelve months so as to be eligible for the award of the degree of Pharm.D. or Pharm.D. (Post Baccalaureate) as the case may be.

4. Assessment of internship:

i) The intern shall maintain a record of work which is to be verified and certified by the preceptor (teacher practioner) under whom he works. Apart from scrutiny of the record of work, assessment and evaluation of training shall be undertaken by an objective approach using situation tests in knowledge, skills and attitude during and at the end of the training. Based on the record of work and date of evaluation, the Dean shall issue certificate of satisfactory completion of training, which is mandatory for award of degree.

ii) Satisfactory completion of internship shall be determined on the basis of the following

(1) Proficiency of knowledge required for each case management SCORE 0-5

(2) The competency in skills expected for providing Clinical Pharmacy Services SCORE 0-5

(3) Responsibility, punctuality, work up of case, involvement in patient care SCORE 0-5

(4) Ability to work in a team (Behavior with other healthcare professionals including medical doctors, nursing staff and colleagues). SCORE 0-5

(5) Initiative, participation in discussions, research aptitude.

SCORE 0-5

0-Poor; 1- Fair; 2-Below Average; 3-Average; 4-Above Average; 5-Excellent;

A Score of less than 3 in any of above items will declared as Fail in internship.

If a student is failed in internship, he has to undergo three months internship as extension and appear for reevaluation.

The result of internship Pass/Fail shall be notified in the Mark sheet.

12. Pass Marks:

A student shall be declared as "PASS" in a course if he/she secures a minimum of 50% of the total marks obtained from Internal assessment and year End Evaluation. Otherwise, he/she shall be declared as "FAIL" in that course. This is not applicable for internship.

12.1. Recounting /Revaluation/Personal Verification/ Challenging Evaluation:

Students shall be permitted to apply for Recounting /Revaluation/Personal Verification/ Challenging Evaluation of the Year End Examination answer scripts within a stipulated period after payment of the prescribed fee. After completion of the process of Recounting/ Revaluation/Personal Verification/ Challenging Evaluation, the records are updated with changes if any, and the student shall be issued a revised mark sheet. If there are no changes, the student shall be intimated the same through a notice.

12.2 Improvement of Internal Assessment

A student shall have the opportunity to improve his/ her performance only once in the mid exam component of internal assessment. The reconduct of mid exam shall be completed before the commencement of end examination of that year.

13. Withholding of Results

Results may be withheld in a year, if

- The student has any dues to the Department/ School/ University
- Action arising out of malpractice is pending
- Action arising out of indiscipline is pending
- The student whose result was withheld shall not be allowed/promoted to the next higher year.

After successful completion of the program and minimum pass mark requirements as specified in the program curriculum, a Provisional Certificate will be issued to eligible students. The degree will be conferred on the student during the subsequent Convocation. The degree certificate will indicate the name of the Program of study, in which the student has graduated. Example: 'Doctor of Pharmacy (Post Baccalaureate)

14. Award of Class

The marks requirement for the award of class is as follow

Percentage of marks Secured	Class Awarded
≥ 75	First Class with Distinction
≥60 and <74.99	First Class
≥50 and <59.99	Second Class

15. Migration / Transfer of Candidates

- If a student discontinued in any of the year and later, he wishes to continue in the same program, then the he shall follow the latest regulations and curriculum that is being implemented during readmission into the same year. However, the earned marks before discontinued shall be transferred and he has to complete his degree within the stipulated program duration.
- A similar procedure shall be adopted for the candidates who are seeking admission from other universities into various eligible programs of the University, subject to the condition that those Universities are recognized and approved for transfer by MBU.
- If the other Universities follow a different system, then the program School into which the student is seeking admission/ transfer shall work out on equivalence that are to be transferred with valid supporting documentation.
- The number of completed courses thus transferred will be considered for the minimum requirements of the program, but not considered for award of class calculations. The courses along with secured marks thus transferred will be indicated at the bottom of the Consolidated mark sheet as 'Total Courses Transferred from (Name of the Institute, place and Country)' and no breakup of courses will be listed.

Award of degree classification is purely based on the marks secured considering during the program of study with the MBU.

16. Program Duration

Minimum Duration: The minimum duration for Pharm.D and Pharm.D(PB) Programs is detailed below

A student is said to be completed the program only if he/she successfully pass all courses as specified in their program curriculum. However, the degree shall be awarded only upon the completion of minimum duration of the program concerned.

Maximum Duration: if a student has backlog courses even after the completion of the minimum duration limit, an additional grace period equivalent to double the period of minimum duration of the program of study shall be extended. Under no circumstances, the period of study shall be extended beyond the above limit and thereafter his/her studentship stands cancelled automatically. No separate intimation in this regard will be sent to the student.

17. Award of Degree

Eligibility: A student shall be eligible for the award of Pharm.D Degree or Pharm.D(PB) if he fulfills all the following conditions:

- Registered and successfully completed all the components prescribed in the Program of study to which he is admitted.
- Has NO DUES to the University, Hostel, Library etc. and to any other amenities provided by the University.
- No disciplinary action is pending against him.

After successful completion of the program and minimum pass requirements as specified in the program curriculum, a Provisional Certificate will be issued to eligible students. The degree will be conferred on the student during the subsequent Convocation.

18. Amendments to Regulations

The Academic Council headed by the Vice-Chancellor of the University has the right to revise, amend, or change any component of regulations from time to time. In case of any dispute arising in interpreting the rules, the Academic Council's interpretation shall be the final decision.

19. General

The words such as "he", "him", "his" and "her" shall be understood to include all students irrespective of gender connotation.

Note: Failure to read and understand the regulations is not an excuse.

GUIDELINES FOR DISCIPLINARY ACTION FOR MALPRACTICES /

IMPROPER CONDUCT IN EXAMINATIONS

Rule No.	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 course 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 course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course 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 course 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 course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Year. The Hall Ticket of the candidate is to be cancelled.
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 years from class work and all Year-end 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 courses of the examination (including labs and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that year. The candidate is also debarred for four consecutive years from class work and all Year-end examinations, if his involvement is established. Otherwise, The candidate is

Rule No.	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
		debarred for two consecutive years from class work and all Year-end 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 course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that year. The candidate is also debarred for two consecutive years from class work and all Year-end 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 course only.
6.	Refuses to obey the orders of the Chief Controller of Examinations/Controller of Examinations/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, or threatens the Controller of Examinations or any person on duty in or 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 Controller of Examinations, or any person 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	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that year. If the candidate physically assaults the invigilator/Controller 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 police and a police case is registered against them.

Rule No.	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
	tendency to disrupt the orderly conduct of the examination.	
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 course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that year. The candidate is also debarred for two consecutive years from class work and all Year-end examinations. The continuation 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 course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that year. The candidate is also debarred and forfeits the seat.

Note: Whenever the performance of a student is cancelled in any course(s) due to Malpractice, then it shall be treated as failed in that course.

Course Structure

Pharm. D

I Year

S. No.	Course Code	Course Title	Contact Periods per Week				Scheme of Examination Max. Marks		
			L	T	P	Total	Int. Marks	Ext. Marks	Total Marks
1.	23PC201001	Human Anatomy and Physiology	3	1	-	4	30	70	100
2.	23PH201008	Pharmaceutics	2	1	-	3	30	70	100
3.	23PA201009	Medicinal Biochemistry	3	1	-	4	30	70	100
4.	23PA201010	Pharmaceutical Organic Chemistry	3	1	-	4	30	70	100
5.	23PA201011	Pharmaceutical Inorganic Chemistry	2	1	-	3	30	70	100
6.	23PC205001	Human Anatomy and Physiology Practical	-	-	3	3	30	70	100
7.	23PH205003	Pharmaceutics Practical	-	-	3	3	30	70	100
8.	23PA205003	Medicinal Biochemistry Practical	-	-	3	3	30	70	100
9.	23PA205004	Pharmaceutical Organic Chemistry Practical	-	-	3	3	30	70	100
10.	23PA205005	Pharmaceutical Inorganic Chemistry Practical	-	-	3	3	30	70	100
11.	23PY201002	Remedial Mathematics *	3	1	-	4	30	70	100
12.	23PY201003	Remedial Biology*							
13.	23PY205001	Remedial Biology Practical *	-	-	3	3	30	70	100
		Total	**16**	**06**	**18**	**40**	**360**	**840**	**1200**

*

1. Students who had studied Higher Secondary (10+2) with Mathematics, Physics and Chemistry should mandatorily study Remedial Biology (Theory) and Remedial Biology (Practical).
2. Student who studied Biology, Physics and Chemistry in Higher Secondary then he/she mandatorily study Remedial Mathematics (Theory) only.
3. If a student studied Mathematics and biology in Higher secondary, then the student shall choose any one of the above combinations.

II Year

S. No.	Course Code	Course Title	Contact Periods per Week				Scheme of Examination Max. Marks		
			L	T	P	Total	Int. Marks	Ext. Marks	Total Marks
1.	23PP201001	Pathophysiology	3	1	-	4	30	70	100
2.	23PH201009	Pharmaceutical Microbiology	3	1	-	3	30	70	100
3.	23PY201004	Pharmacognosy and Phytopharmaceuticals	3	1	-	4	30	70	100
4.	23PC201002	Pharmacology – I	2	1	-	3	30	70	100
5.	23PP201002	Community Pharmacy	2	1	-	3	30	70	100
6.	23PP201003	Pharmacotherapeutics – I	3	1	-	4	30	70	100
7.	23PH205004	Pharmaceutical Microbiology Practical	-	-	3	3	30	70	100
8.	23PY205002	Pharmacognosy and Phytopharmaceuticals Practical	-	-	3	3	30	70	100
9.	23PP205001	Pharmacotherapeutics – I Practical	-	-	3	3	30	70	100
		Total	**16**	**06**	**9**	**30**	**270**	**630**	**900**

III Year

S. No.	Course Code	Course Title	Contact Periods per Week				Scheme of Examination Max. Marks		
			L	T	P	Total	Int. Marks	Ext. Marks	Total Marks
1.	23PC201003	Pharmacology - II	3	1	-	4	30	70	100
2.	23PA201012	Pharmaceutical Analysis	3	1	-	4	30	70	100
3.	23PP201004	Pharmacotherapeutics - II	3	1	-	4	30	70	100
4.	23PH201010	Pharmaceutical Jurisprudence	2	-	-	2	30	70	100
5.	23PA201013	Medicinal Chemistry	3	1	-	4	30	70	100
6.	23PH201011	Pharmaceutical Formulations	2	1	-	3	30	70	100
7.	23PC205002	Pharmacology – II Practical	-	-	3	3	30	70	100
8.	23PA205006	Pharmaceutical Analysis Practical	-	-	3	3	30	70	100
9.	23PP205002	Pharmacotherapeutics – II Practical	-	-	3	3	30	70	100
10.	23PA205007	Medicinal Chemistry Practical	-	-	3	3	30	70	100
11.	23PH205005	Pharmaceutical Formulations Practical	-	-	3	3	30	70	100
		Total	**16**	**05**	**15**	**36**	**330**	**770**	**1100**

IV Year

S. No.	Course Code	Course Title	Contact Periods per Week				Scheme of Examination Max. Marks		
			L	T	P	Total	Int. Marks	Ext. Marks	Total Marks
1.	23PP201005	Pharmacotherapeutics-III	3	1	-	4	30	70	100
2.	23PP201006	Hospital Pharmacy	2	1	-	3	30	70	100
3.	23PP201007	Clinical Pharmacy	3	1	-	4	30	70	100
4.	23PY201005	Biostatistics and Research Methodology	2	1	-	3	30	70	100
5.	23PH201012	Biopharmaceutics and Pharmacokinetics	3	1	-	4	30	70	100
6.	23PP201008	Clinical Toxicology	2	1	-	3	30	70	100
7.	23PP205003	Pharmacotherapeutics-III Practical		-	3	3	30	70	100
8.	23PP205004	Hospital Pharmacy Practical		-	3	3	30	70	100
9.	23PP205005	Clinical Pharmacy Practical		-	3	3	30	70	100
10.	23PH205006	Biopharmaceutics and Pharmacokinetics Practical		-	3	3	30	70	100
Total			**15**	**6**	**12**	**33**	**300**	**700**	**1000**

V Year

S. No.	Course Code	Course Title	Contact Periods per Week					Scheme of Examination Max. Marks	
			L	T	P	Total	Int. Marks	Ext. Marks	Total Marks
1.	23PP201009	Clinical Research	3	1	-	4	30	70	100
2.	23PP201010	Pharmacoepidemiology and Pharmacoeconomics	3	1	-	4	30	70	100
3.	23PP201011	Clinical Pharmacokinetics and Pharmacotherapeutic Drug Monitoring	2	1	-	3	30	70	100
4.	23PP211001	Clerkship	-	-	3	3	30	70	100
5.	23PP209001	Project work	-	-	18	18	30	70	100
Total			**8**	**3**	**21**	**32**	**150**	**350**	**500**

VI Year

S. No.	Course Code	Course Title	Contact Periods per Week					Scheme of Examination Max. Marks	
			L	T	P	Total	Int. Marks	Ext. Marks	Total Marks
1.	23PP211002	Internship	-	-	-	-	-	-	-

Internship period: 12 Months (The student has to undergo internship in the designated Hospital)

Course Code	Course Title	L	T	P
23PC201001	**HUMAN ANATOMY AND PHYSIOLOGY**	3	1	-

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course provides a comprehensive overview of human anatomy and physiology, covering cellular structures, tissues, skeletal, cardiovascular, lymphatic, respiratory, digestive, nervous, urinary, endocrine, reproductive systems, and sense organs. It also addresses common disorders and the physiological effects of exercise and drugs on the human body.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand anatomy and physiology basics, including terminologies, cellular structures, components, functions, and types of human tissues.

CO2. Describe the skeletal system, joint classifications, movements, and common disorders. Analyze blood composition, haemopoesis, clotting mechanisms, and blood disorders.

CO3. Explain lymphatic system functions, spleen structure, and lymphatic disorders. Comprehend cardiovascular system anatomy, heart functions, circulation, ECG, and related disorders.

CO4. Understand respiratory system anatomy, mechanisms, gas transport, and disorders. Describe digestive system anatomy, accessory glands, digestion, and absorption processes.

CO5. Explain nervous system anatomy and functions, including cerebrum, cerebellum, midbrain, thalamus, hypothalamus, spinal cord, cranial nerves, and the autonomic nervous system.

CO6. Describe the endocrine system, reproductive system, sense organs, skeletal muscles, exercise effects on physiology, and the impact of drugs on athletic performance.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	3	-	2	-	-	2	-	-	-	3	-	-	-	2	-	-
CO5	3	-	2	-	-	2	-	-	-	2	-	-	-	2	-	-
CO6	3	-	2	-	-	-	-	-	-	2	-	-	-	2	-	-
Course Correlation Mapping	2.7	-	2	-	-	2	-	-	-	2.3	-	-	-	2	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: INTRODUCTION, CELLS, AND TISSUES *(10 Periods)*

- **Scope of Anatomy and Physiology:** Basic terminologies used in this subject (Description of the body as such planes and terminologies)
- **Structure of Cell:** Its components and their functions
- **Elementary Tissues of the Human Body:** Epithelial, connective, muscular, and nervous tissues - their sub-types and characteristics.

MODULE 2: OSSEOUS AND HAEMOPOETIC SYSTEMS *(13 Periods)*

- **Osseous System:**
  - Structure, composition, and functions of the skeleton.
  - Classification of joints, types of movements of joints, and disorders of joints (Definitions only)
- **Haemopoetic System:**
  - Composition and functions of blood
  - Haemopoesis and disorders of blood components (definition of disorder)
  - Blood groups
  - Clotting factors and mechanism
  - Platelets and disorders of coagulation

MODULE 3: LYMPHATIC AND CARDIOVASCULAR SYSTEMS *(12 Periods)*

- **Lymph:**
  - Lymph and lymphatic system: composition, formation, and circulation
  - Spleen: structure and functions, disorders
  - Disorders of the lymphatic system (definition only)
- **Cardiovascular System:**
  - Anatomy and functions of the heart
  - Blood vessels and circulation (Pulmonary, coronary, and systemic circulation)
  - Electrocardiogram (ECG)
  - Cardiac cycle and heart sounds
  - Blood pressure – its maintenance and regulation
  - Definition of the following disorders: Hypertension, Hypotension, Arteriosclerosis, Atherosclerosis, Angina, Myocardial infarction, Congestive heart failure, Cardiac arrhythmias.

MODULE 4: RESPIRATORY AND DIGESTIVE SYSTEMS *(13 Periods)*

- **Respiratory System:**
  - Anatomy of respiratory organs and functions
  - Mechanism/physiology of respiration and regulation of respiration
  - Transport of respiratory gases
  - Respiratory volumes and capacities
  - Definition of Hypoxia, Asphyxia, Dybarism, Oxygen therapy, and resuscitation.
- **Digestive System:**
  - Anatomy and physiology of the gastrointestinal tract (GIT)
  - Anatomy and functions of accessory glands of GIT
  - Digestion and absorption
  - Disorders of GIT (definitions only)

MODULE 5: NERVOUS AND URINARY SYSTEMS *(12 Periods)*

- **Nervous System**: Definition and classification of the nervous system - Anatomy, physiology, and functional areas of the cerebrum - Anatomy and physiology of the cerebellum - Anatomy and physiology of the midbrain - Thalamus, hypothalamus, and Basal Ganglia - Spinal cord: Structure & reflexes – mono-poly-planter - Cranial nerves – names and functions - ANS – Anatomy & functions of the sympathetic & parasympathetic

nervous system.

- **Urinary System:** Anatomy and physiology of the urinary system - Formation of urine - Renin-Angiotensin system – Juxtaglomerular apparatus - acid-base balance - Clearance tests and micturition.

MODULE 6: ENDOCRINE, REPRODUCTIVE, SENSE ORGANS, MUSCLES, AND SPORTS PHYSIOLOGY ***(15 Periods)***

- **Endocrine System** - Pituitary gland - Adrenal gland - Thyroid and Parathyroid glands - Pancreas and gonads.
- **Reproductive System** - Male and female reproductive system - Their hormones – Physiology of menstruation - Spermatogenesis & Oogenesis - Sex determination (genetic basis) - Pregnancy and maintenance, and parturition - Contraceptive devices.
- **Sense Organs** - Eye - Ear - Skin - Tongue & Nose.
- **Skeletal Muscles** - Histology - Physiology of muscle contraction - Physiological properties of skeletal muscle and their disorders (definitions).
- **Sports Physiology** - Muscles in exercise, Effect of athletic training on muscles and muscle performance - Respiration in exercise, CVS in exercise, Body heat in exercise, Body fluids and salts in exercise - Drugs and athletics.

Total Periods: 75

RESOURCES

BOOKS:

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.

2. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A.

3. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.

4. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=q6fQf6VLDOY
2. https://www.youtube.com/watch?v=sRMAvOeOy8I
3. https://www.youtube.com/watch?v=q6fX7f3sLaU

WEB RESOURCES:

1. https://westerntc.libguides.com/anatomy/websites
2. https://libguides.wccnet.edu/oer-subjects/anatomy-physiology
3. https://openstax.org/details/books/anatomy-and-physiology

Course Code	Course Title	L	T	P
23PH201008	**PHARMACEUTICS**	**2**	**1**	**-**

Pre-Requisite -

Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course covers pharmacy fundamentals, including dosage forms, prescription handling, and posology. Students will explore pharmacy history, pharmacopoeias, pharmaceutical calculations, and the formulation of powders, liquids, suppositories, and galenicals. It also includes surgical aids and managing pharmaceutical incompatibilities for safe medication use.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understand the classification and definitions of dosage forms, handle prescriptions accurately, and calculate appropriate doses for children and infants.

CO2. Trace the historical development of the pharmacy profession and pharmaceutical industry, and comprehend the evolution and significance of various pharmacopoeias, including the Indian Pharmacopoeia.

CO3. Perform pharmaceutical calculations, including percentage solutions, allegations, proof spirit, and isotonic solutions, and apply these skills in practical scenarios.

CO4. Explain the preparation and evaluation of various solid and liquid dosage forms, such as powders, granules, monophasic, and biphasic liquids, and understand their advantages and disadvantages.

CO5. Describe the preparation and evaluation of semi-solid dosage forms, including suppositories, pessaries, and galenicals, and understand the principles of different extraction processes.

CO6. Identify and address pharmaceutical incompatibilities, and understand the use and preparation of surgical aids, including dressings, sutures, ligatures, and medicated bandages.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	-	-	-	-	3	-	-	-	-	-	-	2	-	-
CO4	2	3	-	-	-	-	3	-	-	-	-	-	-	2	-	-
CO5	2	2	-	2	-	-	-	-	-	-	-	-	-	2	-	-
CO6	2	-	-	-	-	-	2	-	-	-	-	-	-	2	-	-
Course Correlation Mapping	2.5	2.3	-	2	-	-	2.7	-	-	-	-	-	-	2	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: INTRODUCTION AND FUNDAMENTALS ***(10 Periods)***

- **Introduction to Dosage Forms:**
  - Classification and definitions
  - Prescription: definition, parts, and handling
  - Posology: Definition, factors affecting dose selection, calculation of children and infant doses
- **Historical Background and Development:**
  - Development of the profession of pharmacy and the pharmaceutical industry
-

MODULE 2: PHARMACOPOEIAS AND CALCULATIONS ***(15 Periods)***

- **Pharmacopoeias:**
  - Development of Indian Pharmacopoeia
  - Introduction to BP, USP, European Pharmacopoeia, Extra Pharmacopoeia, and Indian National Formulary
- **Weights and Measures:**
  - Calculations involving percentage solutions, allegation, proof spirit, isotonic solutions.

MODULE 3: SOLID DOSAGE FORMS ***(10 Periods)***

- **Powders and Granules:**
  - Classification, advantages, and disadvantages
  - Preparation of simple, compound powders, insufflations, dusting powders, eutectic and explosive powders, tooth powder, effervescent powders, and granules.

MODULE 4: LIQUID DOSAGE FORMS ***(15 Periods)***

- **Monophasic Dosage Forms:**
  - Theoretical aspects of formulation including adjuvants like stabilizers, colorants, flavors with examples
  - Study of monophasic liquids like gargles, mouth washes, throat paint, ear drops, nasal drops, liniments, lotions, enemas, and collodions
- **Biphasic Dosage Forms:**
  - Suspensions and emulsions: definition, advantages, disadvantages, classification, tests for the type of emulsion, formulation, stability, and evaluation.

MODULE 5: SEMI-SOLID DOSAGE FORMS AND EXTRACTION PROCESSES ***(10 Periods)***

- **Suppositories and Pessaries:**
  - Definition, advantages, disadvantages, types of bases, method of preparation, displacement value, and evaluation
- **Galenicals:**
  - Definition, equipment for different extraction processes like infusion, decoction, maceration, and percolation
  - Methods of preparation of spirits, tinctures, and extracts

MODULE 6: CALCULATIONS, SURGICAL AIDS, AND INCOMPATIBILITIES ***(15 Periods)***

- **Pharmaceutical Calculations**
- **Surgical Aids:**Surgical dressings, absorbable gelatin sponge, sutures, ligatures, and medicated bandages
- **Incompatibilities:** Introduction, classification, and methods to overcome incompatibilities

Total Periods: 75

RESOURCES:

BOOKS:

1. Cooper and Gunns Dispensing for pharmacy students.
2. A text book Professional Pharmacy by N.K.Jain and S.N.Sharma
3. Introduction to Pharmaceutical dosage forms by Howard C. Ansel.
4. Remington's Pharmaceutical Sciences.
5. Register of General Pharmacy by Cooper and Gunn
6. General Pharmacy by M.L.Schroff

VIDEO LECTURES:

1. https://youtu.be/maIrUdbm3jw
2. https://youtu.be/3OuiWb7jDKI
3. https://youtu.be/O5GWBwowecI
4. https://youtu.be/-weNeW6JfsQ
5. https://youtu.be/js_VZ1pHmCE

Web Resources:

1. http://www.triphasepharmasolutions.com/Private/USP%201151%20PHARMACEUTICAL%20DOSAGE%2
2. http://gputtawar.edu.in/downloads/Monophasic%20Liquid%20Dosage%20Forms.pdf
3. https://uomustansiriyah.edu.iq/media/lectures/4/4_2018_05_19!04_12_49_PM.pdf

Course Code	Course Title	L	T	P
23PA201009	**MEDICINAL BIOCHEMISTRY**	3	1	-

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course is designed to impart knowledge on the chemical process at

the molecular level in living cells and the chemical aspects of cells in health and illness for diagnosis, treatment, and prevention of diseases. They also understand the metabolic process of biomolecules and the genetic organization of the mammalian genome with its expression.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Demonstrate a thorough understanding of cell biochemical organization, the transport process across cell membranes, and the significance of energy-rich compounds such as ATP and cyclic AMP.

CO2. Understand the fundamentals of enzyme activity, including their nomenclature, classification, factors affecting their activity, and their therapeutic and diagnostic applications.

CO3. Explain the metabolic pathways of carbohydrates and proteins, including glycolysis, TCA cycle, gluconeogenesis, and the urea cycle, along with related metabolic disorders and their regulation.

CO4. Analyze lipid and nucleic acid metabolism, including β-oxidation, ketogenesis, fatty acid biosynthesis, cholesterol metabolism, and the processes of protein synthesis, mutation, and DNA repair mechanisms.

CO5. Describe the coenzyme systems involved in biological oxidation, the electron transport chain, oxidative phosphorylation, and the mechanisms regulating these processes.

CO6. Apply knowledge of clinical chemistry to understand kidney and liver function tests, lipid profile assessments, and immunochemical techniques, including RIA and ELISA, for diagnosing and monitoring various diseases.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO5	3	-	-	3	-	-	-	-	-	-	-	-	-	2	-	-
CO6	3	2	-	-	-	3	-	-	-	-	-	2	-	2	-	-
Course Correlation Mapping	2.3	2	-	3	-	3	-	-	-	-	-	2	-	2	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: INTRODUCTION & ENZYMES *(10 Periods)*

- Cells and their biochemical organization are part of the transport process across the cell membranes. Energy-rich compounds; ATP, Cyclic AMP and their biological significance.
- Definition; Nomenclature; IUB classification; Factor affecting enzyme activity; Enzyme action; enzyme inhibition. Isoenzymes and their therapeutic and diagnostic applications; Coenzymes and their biochemical role and deficiency diseases.

MODULE2: CARBOHYDRATE & PROTEIN METABOLISM ***(15 Periods)***

- Glycolysis, Citric acid cycle (TCA cycle), HMP shunt, Glycogenolysis, gluconeogenesis, glycogenesis. Metabolic disorders of carbohydrate metabolism (diabetes mellitus and glycogen storage diseases); Glucose, Galactose tolerance test and their significance; hormonal regulation of carbohydrate metabolism.
- Protein turnover; nitrogen balance; Catabolism of Amino acids (Transamination, deamination & decarboxylation). Urea cycle and its metabolic disorders; production of bile pigments; hyperbilirubinemia, porphyria, jaundice. Metabolic disorder of Amino acids.

MODULE3: LIPID & NUCLEIC ACID METABOLISM ***(15 Periods)***

- Oxidation of saturated (β-oxidation); Ketogenesis and ketolysis; biosynthesis of fatty acids, lipids; metabolism of cholesterol; Hormonal regulation of lipid metabolism. Defective metabolism of lipids (atherosclerosis, fatty liver, hypercholesterolemia).
- Metabolism of purine and pyrimidine nucleotides; Protein synthesis; Genetic code; inhibition of protein synthesis; mutation and repair mechanism; DNA replication (semiconservative /onion peel models) and DNA repair mechanism.

MODULE 4: BIOLOGICAL OXIDATION ***(10 Periods)***

- Coenzyme system involved in biological oxidation. Electron transport chain (its mechanism in energy capture; regulation and inhibition); Uncouplers of ETC; Oxidative phosphorylation.

MODULE 5: CLINICAL CHEMISTRY AND KIDNEY FUNCTION TESTS ***(10 Periods)***

- **Introduction to clinical chemistry:** Cell; composition; malfunction; Roll of the clinical chemistry laboratory
- **The kidney function tests:** Role of the kidney; Laboratory tests for normal function include Tests for NPN constituents. (Creatinine /urea clearance, determination of blood and urine creatinine, urea and uric acid), Urine concentration test, Urinary tract calculi. (stones)
- **Electrolytes:** Body water, compartments, water balance, and electrolyte distribution. Determination of sodium, calcium potassium, chlorides, and bicarbonates in the body fluids.

MODULE 6: LIVER FUNCTION, LIPID PROFILE, AND IMMUNOCHEMICAL TECHNIQUES ***(15 Periods)***

- **Liver function tests:** Physiological role of liver, metabolic, storage, excretory, protective, circulatory functions and function in blood coagulation, Test for hepatic dysfunction-Bile pigments metabolism
- **Hepatic function tests:** Serum bilirubin, urine bilirubin, and urine urobilinogen. Dye tests of excretory function. Tests are based on abnormalities of serum proteins.
- **Lipid profile tests:** Lipoproteins, composition, functions. Determination of serum lipids, total cholesterol, HDL cholesterol, LDL cholesterol, and triglycerides.
- **Immunochemical techniques**: for determination of hormone levels and protein levels in serum for endocrine diseases and infectious diseases. Radio immuno assay (RIA) and Enzyme Linked Immuno Sorbent Assay (ELISA).

Total Periods: 75

RESOURCES

BOOKS:

1. Textbook of Medical Biochemistry by MN Chatterjee Rana Shinde
2. Textbook Of Biochemistry For Medical Students DM. Vasudevan, Sreekumari S. , Kannan Vaidyanathan.
3. Text Book of Medical Biochemistry by Ramakrishnan, Prasannan & Rajan
4. Biochemistry by A.C.Deb
5 Lehninger Principles of Biochemistry, 6th edition, by David L. Nelson and Michael M. Cox.
5 Biochemistry by Voet and Voet

VIDEO LECTURES:

1. https://archive.nptel.ac.in/courses/104/105/102105034/
2. https://ocw.mit.edu/courses/7-05-general-biochemistry-spring-2020/resources/lecture-20-bioenergetics-intro-pathways-glycolysis-i/
3. https://ocw.mit.edu/courses/7-05-general-biochemistry-spring-2020/resources/lecture-23-tca-cycle-ii/
4. https://www.pearson.com/channels/biochemistry

WEB RESOURCES:

1. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMB1102.pdf
2. https://faculty.ksu.edu.sa/sites/default/files/bch-201-general_biochemistry-1_farid2.pdf
3. https://annamalaiuniversity.ac.in/studport/download/agri/soilsci/resources/SAC%20124%20fundamentals%20of%20biochemistry%20lecture%20notes.pdf
4. http://aulanni.lecture.ub.ac.id/files/2012/01/15616949-Lehninger-Principles-of-Biochemistry-1-copy.pdf

Course Code	Course Title	L	T	P
23PA201010	**PHARMACEUTICAL ORGANIC CHEMISTRY**	3	1	-

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course provides an in-depth understanding of organic chemistry, covering molecular structure, bond polarity, intermolecular forces, solubility, and nomenclature. Students will explore free radical chain reactions, alicyclic compound preparations, nucleophilic substitution, dehydrohalogenation, addition reactions, and resonance theory. The course also examines electrophilic aromatic substitution, condensation, rearrangement reactions, nucleophilic aromatic substitution, oxidation-reduction reactions, and the preparation, purity testing, assay, and medicinal uses of essential official compounds.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understand and explain the structural and physical properties of organic molecules, including bond polarity, intermolecular forces, solubility, and isomerism. Demonstrate proficiency in the nomenclature of various classes of organic compounds.

CO2. Analyze the mechanisms and stability of free radical chain reactions in alkanes, and describe the properties and preparations of alicyclic compounds, including the Baeyer strain theory.

CO3. Evaluate the mechanisms and kinetics of nucleophilic aliphatic substitution reactions (SN1 and SN2), considering factors such as nucleophiles, leaving groups, and solvents.

CO4. Investigate and compare the mechanisms of dehydrohalogenation and electrophilic and free radical addition reactions, applying concepts such as Markovnikov rule, peroxide effect, and cycloaddition.

CO5. Apply the theory of resonance to organic molecules, analyze the effects of substituents in electrophilic aromatic substitution reactions, and understand the concepts of hyperconjugation and resonance stabilization.

CO6. Explain and apply the mechanisms of various condensation and rearrangement reactions, nucleophilic aromatic substitution, and oxidation-reduction reactions. Understand the preparation, purity tests, assay, and medicinal uses of key official compounds.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO5	2	-	-	3	-	-	-	-	-	-	-	-	-	2	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Course Correlati	2.6	2	-	3	-	-	-	-	-	-	-	-	-	2	-	-

on Mapping																

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: STRUCTURES, PROPERTIES, AND NOMENCLATURE *(10 Periods)*

- **Structures and Physical Properties:**
  - Polarity of bonds, polarity of molecules, melting point, intermolecular forces, boiling point, solubility, non-ionic solutes and ionic solutes, protic and aprotic solvents, ion pairs.
  - Acids and bases, Lowry-Bronsted and Lewis theories.
  - Isomerism.
- **Nomenclature of Organic Compounds:**
  - Alkanes, Alkenes, Dienes, Alkynes, Alcohols, Aldehydes, Ketones, Amides, Amines, Phenols, Alkyl Halides, Carboxylic Acid, Esters, Acid Chlorides, Cycloalkanes.

MODULE2: RADICAL REACTIONS AND ALICYCLIC COMPOUNDS *(12 Periods)*

- **Free Radical Chain Reactions of Alkanes:** Mechanism, relative reactivity, and stability.
- **Alicyclic Compounds:** Preparations of cycloalkanes, Baeyer strain theory, and orbital picture of angle strain.
- **Nucleophilic Aliphatic Substitution Mechanism:** Nucleophiles and leaving groups, the kinetics of second and first-order reaction, mechanism and kinetics of SN2 reactions, stereochemistry and steric hindrance, the role of solvents, phase transfer catalysis, mechanism and kinetics of SN1 reactions, stereochemistry, carbocation, and their stability, rearrangement of carbocation, the role of solvents in SN1 reaction, ion-dipole bonds, SN2 versus SN1 solvolyses, nucleophilic assistance by the solvents.

MODULE3: ELIMINATION REACTIONS AND ADDITIONS *(13 Periods)*

- **Dehydrohalogenation of Alkyl Halides:** 1,2-elimination, kinetics, E2 and E1 mechanism, elimination via carbocation, evidence for E2 mechanism, absence of rearrangement isotope effect, absence of hydrogen exchange, the element effect, orientation and reactivity, E2 versus E1, elimination versus substitution, dehydration of alcohol, ease of dehydration, acid catalysis, reversibility, orientation.
- **Electrophilic and Free Radicals Addition:** Reactions at carbon-carbon double bond, electrophile, hydrogenation, the heat of hydrogenation and stability of alkenes, Markovnikov rule, the addition of hydrogen halides, the addition of hydrogen bromides, peroxide effect, electrophilic addition, mechanism, rearrangement, absence of hydrogen exchange, orientation, and reactivity, addition of halogen, mechanism, halohydrin formation, mechanism of free radicals addition, mechanism of peroxide-initiated addition of hydrogen bromide, orientation of free radical addition, additions of carbene to alkene, cycloaddition reactions.

MODULE 4: RESONANCE AND DOUBLE BONDS *(15 Periods)*

- **Carbon-Carbon Double Bond as Substituents:** Free radical halogenations of alkenes, comparison of free radical substitution with free radical addition, free radical substitution in alkenes, orientation and reactivity, allylic rearrangements.
- **Theory of Resonance:** Allyl radical as a resonance hybrid, stability, orbital picture, resonance stabilization of allyl radicals, hyperconjugation, allyl cation as a resonance hybrid, nucleophilic substitution in the allylic substrate, SN1 reactivity, allylic

rearrangement, resonance stabilization of allyl cation, hyperconjugation, nucleophilic substitution in allylic substrate, SN2 nucleophilic substitution in the vinylic substrate, vinylic cation, stability of conjugated dienes, resonance in alkenes, hyperconjugation, ease of formation of conjugated dienes, orientation of elimination, electrophilic addition to conjugated dienes, 1,4-addition, 1,2-versus 1,4-addition, rate versus equilibrium, orientation and reactivity of free radical addition to conjugated dienes.

- **Electrophilic Aromatic Substitution:** Effect of substituent groups, determination of orientation, determination of relative reactivity, classification of substituent groups, mechanism of nitration, sulphonation, halogenation, Friedel-Crafts alkylation, Friedel-Crafts acylation, reactivity and orientation, activating and deactivating ortho-, para-, meta-directing groups, electron release via resonance, effect of halogen on electrophilic aromatic substitution in alkyl benzene, side chain halogenation of alkyl benzene, resonance stabilization of benzyl radical.

MODULE 5: NUCLEOPHILIC REACTIONS AND CONDENSATIONS *(15 Periods)*

- **Nucleophilic Addition Reaction:** Mechanism, ionization of carboxylic acids, acidity constants, acidity of acids, structure of carboxylate ions, effect of substituents on acidity, nucleophilic acyl substitution reaction, conversion of acid-to-acid chloride, esters, amides, and anhydrides. Role of carboxyl group, comparison of alkyl nucleophilic substitution with acyl nucleophilic substitution.
- **Mechanisms of Condensation and Rearrangement Reactions:** Aldol condensation, Claisen condensation, Cannizzaro reaction, crossed Aldol condensation, crossed Cannizzaro reaction, benzoin condensation, Perkin condensation, Knoevenagel reaction, Reformatsky reaction, Wittig reaction, Michael addition.
- **Hoffman Rearrangement and Other Key Reactions:** Migration to electron-deficient nitrogen, Sandmeyer's reaction, basicity of amines, diazotisation and coupling, acidity of phenols, Williamson synthesis, Fries rearrangement, Kolbe reaction, Reimer-Tiemann reaction.

MODULE 6: AROMATIC SUBSTITUTION, REDOX, AND OFFICIAL COMPOUNDS *(10 Periods)*

- **Nucleophilic Aromatic Substitution:** Bimolecular displacement mechanisms, orientation, comparison of aliphatic nucleophilic substitution with that of aromatic.
- **Oxidation and Reduction Reactions.**
- **Study of Official Compounds:** Preparation, test for purity, assay, and medicinal uses of Chlorbutol, Dimercaprol, Glyceryl trinitrate, Urea, Ethylene diamine dihydrate, Vanillin, Paraldehyde, Ethylene chloride, Lactic acid, Tartaric acid, Citric acid, Salicylic acid, Aspirin, Methyl salicylate, Ethyl benzoate, Benzyl benzoate, Dimethyl phthalate, Sodium lauryl sulfate, Saccharin sodium, Mephensin.

Total Periods: 75

RESOURCES

BOOKS:

1 Organic ChemistrybyMorrisonandBoyd

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 Vogel's text book of Practical Organic Chemistry

6 Reaction and reaction mechanism by Ahluwaliah/Chatwal.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=B_ketdzJtY8
2. https://www.youtube.com/watch?v=zFyR1JNJbwk
3. https://www.youtube.com/watch?v=HRz-jH4CAy8
4. https://www.youtube.com/watch?v=X3phEK4tI_4

WEB RESOURCES:

1. https://authors.library.caltech.edu/25032/1/Organic_Chemistry.pdf
2. https://ncert.nic.in/ncerts/l/kech205.pdf
3. https://sites.tufts.edu/andrewrosen/files/2012/05/Orgo-I-Review-Packet1.pdf
4. https://gtu.ge/Agro-Lib/McMurry%20J.E.%20-%20Fundamentals%20of%20Organic%20Chemistry,%207th%20ed.%20-%202010.pdf

Course Code	Course Title	L	T	P
23PA201011	**PHARMACEUTICAL INORGANIC CHEMISTRY**	**2**	**1**	**-**

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course covers fundamental principles of pharmaceutical analysis, including error identification, volumetric, redox, non-aqueous, precipitation, and complexometric titrations. Students will learn about indicators, gravimetry, limit tests, medicinal gases, buffers, cathartics, electrolyte replenishers, trace elements, pharmaceutical aids, dental products, miscellaneous compounds, and radiopharmaceuticals, ensuring comprehensive pharmaceutical knowledge.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Understand and identify errors in pharmaceutical analysis, and conduct accurate volumetric analysis and acid-base titrations.

CO2. Understand and identify errors in pharmaceutical analysis, and conduct accurate volumetric analysis and acid-base titrations.

CO3. Carry out complexometric titrations, apply the theory of indicators, and perform gravimetric analysis.

CO4. Carry out complexometric titrations, apply the theory of indicators, and perform gravimetric analysis.

CO5. Execute limit tests, understand the significance of medicinal gases, and evaluate the use of acidifiers and antacids in formulations.

CO6. Explain the use and mechanism of cathartics, electrolyte replenishers, and understand the role of essential trace elements and antimicrobials.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO6	3	2	-	-	-	3	-	-	-	-	-	-	-	2	-	-
Course Correlation Mapping	2.5	2	-	-	-	3	-	-	-	-	-	-	-	2	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: ERRORS AND VOLUMETRIC ANALYSIS ***(10 Periods)***

- Errors
- Volumetric analysis
- Acid-base titrations

MODULE 2: REDOX, NON-AQUEOUS, AND PRECIPITATION TITRATIONS ***(15 Periods)***

- Redox titrations
- Non-aqueous titrations
- Precipitation titrations

MODULE 3: COMPLEXOMETRIC TITRATIONS AND THEORY OF INDICATORS ***(10 Periods)***

- Complexometric titrations
- Theory of indicators
- Gravimetry

MODULE 4: LIMIT TESTS, MEDICINAL GASES, AND BUFFERS ***(15 Periods)***

- Limit tests
- Medicinal gases
- Acidifiers
- Antacids

MODULE 5: CATHARTICS, ELECTROLYTE REPLENISHERS, AND ESSENTIAL TRACE ELEMENTS ***(10 Periods)***

- Cathartics
- Electrolyte replenishers
- Essential Trace elements
- Antimicrobials

MODULE 6: PHARMACEUTICAL AIDS, DENTAL PRODUCTS, AND MISCELLANEOUS COMPOUNDS ***(15 Periods)***

- Pharmaceutical aids
- Dental Products
- Miscellaneous compounds
- Radio Pharmaceuticals

Total Periods: 75

RESOURCES

TEXT BOOKS:

1 A text book Inorganic medicinal chemistry by Surendra N. Pandeya

2 A. H. Beckett and J. B. Stanlake's Practical Pharmaceutical chemistry Vol -I & Vol-II

3 Inorganic Pharmaceutical Chemistry III-Edition P. Gundu Rao

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc23_cy02/preview
2. https://www.youtube.com/watch?v=OUj4j6td1es
3. https://www.youtube.com/watch?v=hlL0LIKfVvw
4. https://www.youtube.com/watch?v=a4bcGvd-vps

WEB RESOURCES:

1. https://www.t.soka.ac.jp/chem/iwanami/inorg/INO_0001.PDF
2. https://www.chemcome.com/wp-content/uploads/2020/11/Principles-of-inorganic-chemistry-by-Pfennig-Brian-William-z-lib.org_.pdf
3. https://handoutset.com/wp-content/uploads/2022/07/Basic-Concepts-Of-Inorganic-Chemistry-D.N.-Singh-.pdf
4. https://rushim.ru/books/neorganika/Chambers.pdf

Course Code	Course Title	L	T	P
23PY201002	**REMEDIAL MATHEMATICS**	**3**	**1**	**-**

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION:

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 solve algebraic problems using determinants and matrices, understanding their applications in various mathematical contexts.

CO2. demonstrate proficiency in solving problems related to triangle sides, angles, and geometric shapes, including points, lines, circles, and parabolas.

CO3. apply differential calculus concepts to calculate limits and differentiate functions, including composite, parametric, and trigonometric functions.

CO4. use successive differentiation, Leibnitz's theorem, partial differentiation, and Euler's theorem to analyze and solve complex calculus problems involving homogeneous functions.

CO5. compute definite integrals, apply integration methods such as substitution and by parts, and understand the properties of definite integrals.

CO6. solve various differential equations and use Laplace transforms to analyze elementary functions, leveraging properties of linearity and shifting.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	-	-	-	-	-	-	-	-	-	-	2	-	-	2	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	3	-	-	-	-	-	3	-	-	2	-	-
CO4	-	-	-	3	2	-	-	-	-	-	-	-	-	2	-	-
CO5	-	-	-	3	3	-	-	-	-	-	-	-	-	2	-	-
CO6	-	-	-	-	2	-	-	-	-	-	-	-	-	2	-	-
Course Correlation Mapping	-	-	-	3	2.5	-	-	-	-	-	2.5	-	-	2	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: ALGEBRA ***(12 Periods)***

- Determinants
- Matrices

MODULE 2: TRIGONOMETRY AND ANALYTICAL GEOMETRY ***(13 Periods)***

- Sides and angles of a triangle
- Solution of triangles
- Points
- Straight line

MODULE 3: ANALYTICAL GEOMETRY AND DIFFERENTIAL CALCULUS ***(12 Periods)***

- Circle
- Parabola
- Limit of a function
- Differential calculus

MODULE 4: DIFFERENTIAL CALCULUS ***(13 Periods)***

- Differentiation of a sum, product, quotient, composite, parametric, exponential, trigonometric, and logarithmic function
- Successive differentiation
- Leibnitz's theorem
- Partial differentiation
- Euler's theorem on homogeneous functions of two variables

MODULE 5: INTEGRAL CALCULUS ***(11 Periods)***

- Definite integrals
- Integration by substitution and by parts
- Properties of definite integrals

MODULE 6: DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORM ***(14 Periods)***

- Definition, order, degree, variable separable
- Homogeneous, linear, heterogeneous, linear, differential equation with constant coefficient, simultaneous linear equation of second order
- Definition of Laplace transform
- Laplace transform of elementary functions
- Properties of linearity and shifting

Total Periods: 75

RESOURCES

BOOKS:

1 Differential calculus By Shantinarayan

2 Integral calculus By Shanthinarayan

3 Engineering mathematics By B.S.Grewal

4 Trigonometry Part-I By S.L.Loney

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=JbhBdOfMEPs
2. https://www.youtube.com/watch?v=PUB0TaZ7bhA
3. https://www.youtube.com/watch?v=NybHckSEQBI
4. https://www.khanacademy.org/math/ap-calculus-ab/ab-differential-equations-new/ab-7-1/v/differential-equation-introduction

WEB RESOURCES:

1. https://ncert.nic.in/textbook.php?kemh1=0-16
2. https://www.gutenberg.org/files/41568/41568-pdf.pdf
3. https://www.isibang.ac.in/~library/onlinerz/resources/mt-v1.pdf
4. https://www.math.cmu.edu/~jmackey/151_128/bws_book.pdf

Course Code	Course Title	L	T	P
23PY201003	**REMIDIAL BIOLOGY**	**3**	**1**	**-**

Pre-Requisite -
Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Differentiate between various animal phyla and classes, including Aves, and apply knowledge of animal tissues and cell structures to specific studies of representative species.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1 Identify and classify various plant tissues, their structures, and functions, and understand the general organization and classification of plants and plant kingdoms.

CO2. Analyze and describe plant morphology, including roots, stems, leaves, and their modifications, as well as inflorescence, pollination, and the morphology of fruits and seeds.

CO3. Understand plant physiology and taxonomy, including the classification of key plant families like Leguminosae, Umbelliferae, and Solanaceae, and study various fungi and bacteria.

CO4. Examine animal cell structures and tissues, and perform detailed studies on amphibians, focusing on frogs and other key classes such as Pisces and Reptiles.

CO5. Study the general organization of mammals, understanding their structure and function, and explore the characteristics and identification of poisonous animals.

CO6. Differentiate between various animal phyla and classes, including Aves, and apply knowledge of animal tissues and cell structures to specific studies of representative species.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	-	-	-	-	-	3	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	3	3	-	-	-	-	-	-	2	-	-
CO4	-	-	-	-	-	2	2	-	-	-	-	-	-	2	-	-
CO5	-	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-
CO6	-	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-
Course Correlation Mapping	-	-	-	-	-	2.4	2.5	-	-	-	-	-	-	2	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: INTRODUCTION TO PLANTS AND PLANT CLASSIFICATION ***(12 Periods)***

- Introduction
- General organization of plants and its inclusions
- Plant tissues

- Plant kingdom and its classification

MODULE 2: PLANT MORPHOLOGY AND PHYSIOLOGY ***(12 Periods)***

- Morphology of plants
- Root, Stem, Leaf and Its modifications
- Inflorescence and Pollination of flowers
- Morphology of fruits and seeds
- Plant physiology

MODULE 3: PLANT TAXONOMY AND STUDY OF FUNGI ***(15 Periods)***

- Taxonomy of Leguminosae, Umbelliferae, Solanaceae, Liliaceae, Zingiberaceae, Rubiaceae
- Study of Fungi, Yeast, Penicillin and Bacteria

MODULE 4: STUDY OF ANIMAL CELLS AND TISSUES ***(12 Periods)***

- Study of Animal cell
- Study animal tissues

MODULE 5: DETAILED STUDY OF AMPHIBIANS AND REPTILES ***(12 Periods)***

- Detailed study of frog
- Study of Pisces, Reptiles

MODULE 6: STUDY OF AVES, MAMMALS, AND POISONOUS ANIMALS ***(12 Periods)***

- Study of Aves
- General organization of mammals
- Study of poisonous animals

Total Periods: 75

RESOURCES

BOOKS:

1 Remedial biology for I Phram. D by SS Randhava, PV Books.

2 Botany for Degree students by A C Dutta, Oxford publications.

3 Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=VZYYwXdQbHU
2. https://www.youtube.com/watch?v=3XCkEyF45BU
3. https://www.youtube.com/watch?v=3XCkEyF45BU
4. https://www.youtube.com/watch?v=iOlPKdr7pzc

WEB RESOURCES:

1. https://westerntc.libguides.com/anatomy/websites
2. https://libguides.wccnet.edu/oer-subjects/anatomy-physiology

Course Code	Course Title	L	T	P
23PC205001	**HUMAN ANATOMY AND PHYSIOLOGY PRACTICAL**	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION:

Upon completion of this course the student should be able to understand the structure and functions of the human body and understand homeostasis mechanisms in our body and also learn about coordinated working pattern of different organs with each other.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Identify and analyze the numerous tissues and bones that comprise the human body's systems. Apply appropriate tools and analyze numerous hematological variables, record blood pressure of human vitals.

CO2. Comprehend the structure and functions of special sense organs, nervous system, digestive system, respiratory system, cardiovascular systems, urinary system and reproductive systems and endocrine system, family planning appliances and pregnancy diagnosis test. Perform the various experiments related to various nerves, temperature and homeostatic mechanisms of the human body.

CO3. Work as an individual and as a member of a team to solve problems with effective communications

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	-	2	-	-	-	3	2	-	-	-	-	3	-
CO2	3	3	-	-	3	-	-	-	3	2	-	-	-	-	3	-
CO3	-	-	-	-	-	-	-	-	3	-	-	-	-	-	3	-
Course Correlation Mapping	**3**	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**3**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

1. Study of tissues of human body

(a) Epithelial tissue.

(b) Muscular tissue.

2. Study of tissues of human body

(a) Connective tissue.

(b) Nervous tissue.

3. Study of appliances used in hematological experiments.

4. Determination of W.B.C. count of blood.

5. Determination of R.B.C. count of blood.

6. Determination of differential count of blood.

7. Determination of

(a) Erythrocyte Sedimentation Rate.

(b) Hemoglobin content of Blood.

(c) Bleeding time & Clotting time.

8. Determination of

(a) Blood Pressure.

(b) Blood group.

9. Study of various systems with the help of charts, models & specimens

(a) Skeleton system part I-axial skeleton.

(b) Skeleton system part II- appendicular skeleton.

(c) Cardiovascular system.

(d) Respiratory system.

(e) Digestive system.

(f) Urinary system.

(g) Nervous system.

(h) Special senses.

(i) Reproductive system.

10. Study of different family planning appliances.

11. To perform pregnancy diagnosis test.

12. Study of appliances used in experimental physiology.

13. To record simple muscle curve using gastroenemius sciatic nerve preparation.

14. To record simple summation curve using gastroenemius sciatic nerve preparation.

15. To record simple effect of temperature using gastroenemius sciatic nerve preparation.

16. To record simple effect of load & after load using gastroenemius sciatic nerve preparation.

17. To record simple fatigue curve using gastroenemius sciatic nerve preparation.

RESOURCES

BOOKS:

1. Goyal, R. K, Natvar M.P, and Shah S.A, Practical anatomy, physiology and biochemistry, latest edition, Publisher: B.S Shah Prakashan, Ahmedabad.
2. Ranade VG, Text book of practical physiology, Latest edition, Publisher: PVG, Pune Anderson Experimental Physiology, Latest edition, Publisher: NA

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=QdZBg-6k8BI&pp=ygUVcGh5c2lvbG9neSBwcmFjdGljYWxz
2. https://www.youtube.com/watch?v=7BTUnasdQkM&list=PLcVgXSU9gf3vXvZnT6w9Iw3p7kKCL5Ymj
3. https://www.youtube.com/watch?v=AA36gZv5YmY&pp=ygUVcGh5c2lvbG9neSBwcmFjdGljYWxz

WEB RESOURCES:

1. http://repo.jfn.ac.lk/med/bitstream/701/830/1/Manual%20for%20Medical%20Phys%20Pract%202014.pdf3
2. http://students.aiu.edu/submissions/profiles/resources/onlineBook/d5X2x8_practical-physiology-nutrition.pdf
3. https://physiology.elte.hu/gyakorlat/jegyzet/Physiology_Pactical_(2013).pdf

Course Code	Course Title	L	T	P
23PH205003	**PHARMACEUTICS PRACTICAL**	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course is designed to acquire hands on experience in formulating various dosage forms and interpret incompatibilities in perceptions.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the preparations and evaluations of Liquid dosage forms

CO2. Demonstrate the preparations and evaluations of Biphasic Liquid dosage forms and Evaluation

CO3. Demonstrate the preparation evaluation and packaging of different types of Powders and Suppositories

CO4. Apply the basic concept of incompatibility and interpret the concept in problem solving.

CO5. Work independently and communicate effectively in oral and written forms

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-	-
CO4	3	-	2	2	2	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	-	-	-	-	3	3	-	-	3	-	-	-
Course Correlation Mapping	**3**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**-**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

1. Syrups

a. Simple Syrup I.P

b. Syrup of Ephedrine Hcl NF

c. Syrup Vasaka IP

d. Syrup of ferrous Phosphate IP

e. Orange Syrup

2. Elixir

a. Piperizine citrate elixir BP

b. Cascara elixir BPC

c. Paracetamol elixir BPC

3. Linctus

a. Simple Linctus BPC

b. Pediatric simple Linctus BPC

4. Solutions

a. Solution of cresol with soap IP

b. Strong solution of ferric chloride BPC

c. Aqueous Iodine Solution IP

d. Strong solution of Iodine IP

e. Strong solution of ammonium acetate IP

5. Liniments

a. Liniment of turpentine IP*

b. Liniment of camphor IP

6. Suspensions

a. Calamine lotion

b. Magnesium Hydroxide mixture BP

7. Emulsions

a. Cod liver oil emulsion

b. Liquid paraffin emulsion

8. Powders

a. Eutectic powder

b. Explosive powder

c. Dusting powder

d. Insufflations

9. Suppositories

a. Boric acid suppositories

b. Chloral suppositories

10. Incompatibilities

a. Mixtures with Physical

b. Chemical & Therapeutic incompatibilities

RESOURCES

BOOKS:

1. Cooper and Gunns Dispensing for pharmacy students.
2. A text book Professional Pharmacy by N.K.Jain and S.N.Sharma
3. Introduction to Pharmaceutical dosage forms by Howard C. Ansel.
4. Remington's Pharmaceutical Sciences.
5. Register of General Pharmacy by Cooper and Gunn
6. General Pharmacy by M.L.Schroff

VIDEO LECTURES:

1. https://youtu.be/maIrUdbm3jw
2. https://youtu.be/3OuiWb7jDKI
3. https://youtu.be/O5GWBwowecI
4. https://youtu.be/-weNeW6JfsQ
5. https://youtu.be/js_VZ1pHmCE

WEB RESOURCES:

1. http://www.triphasepharmasolutions.com/Private/USP%201151%20PHARMACEUTICAL%20DOSAGE%2
2. http://gputtawar.edu.in/downloads/Monophasic%20Liquid%20Dosage%20Forms.pdf
3. https://uomustansiriyah.edu.iq/media/lectures/4/4_2018_05_19!04_12_49_PM.pdf

Course Code	Course Title	L	T	P
23PA205003	**MEDICINAL BIOCHEMISTRY PRACTICAL**	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course is designed to enable the students determine various biochemical parameters by qualitative and quantitative methods and interpret the results correlated to disease state.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyse qualitatively the normal and abnormal constituents of urine.

CO2. Analyse quantitatively various biomolecules and demonstrate their importance in diagnosis of disease.

CO3. Work independently and in teams to solve problems with effective communications

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	-	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-	-	2	-	-
Course Correlation Mapping	**3**	**3**	-	**-**	2	-	-	**-**	3	**3**	-	-	**-**	**2**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

LIST OF EXPERIMENTS

1. Qualitative analysis of normal constituents of urine, Qualitative analysis of abnormal constituents of urine.
2. Qualitative analysis of abnormal constituents of urine, Quantitative estimation of urine sugar by Benedict's reagent method, Quantitative estimation of urine chlorides by Volhard's method, Quantitative estimation of urine creatinine by Jaffe's method, Quantitative estimation of urine calcium by precipitation method, Quantitative estimation of serum cholesterol by Libermann Burchard's method, Preparation of Folin Wu filtrate from blood,

   Quantitative estimation of blood creatinine, Quantitative estimation of blood sugar Folin-Wu tube method, Estimation of SGOT in serum, Estimation of SGPT in serum, Estimation of Urea in Serum, Estimation of Proteins in Serum, Determination of serum bilirubin.

RESOURCES

BOOKS:

1. Practical Biochemistry by Damodaran Geetha K, aypee Brothers Medical Publishers; second edition (1 January 2016)
2. Textbook of Practical Biochemistry For Medical Students DM. Vasudevan, S.Das.
3. Biochemistry Practical Manual by SoundravallyRajendiran (Author), Pooja Dhiman, Elsevier India (28 January 2019)

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=zHcmxBi_wG0
2. https://www.youtube.com/watch?v=rhTh8LYYBcQ/
3. https://www.biochemistrybasics.com/estimation-of-total-protein-by-biuret-method-biochemistry-practical/

WEB RESOURCES:

1. https://ttk.elte.hu/dstore/document/871/book.pdf
2. https://jru.edu.in/studentcorner/lab-manual/bpharm/2nd-sem/Lab%20Manual%20-%20Biochemistry.pdf
3. https://gmcsurat.edu.in/lib/exe/fetch.php?media=biochemistry:uploads:2015-ug-journal.pdf

Course Code	Course Title	L	T	P
23PA205004	PHARMACEUTICAL ORGANIC CHEMISTRY PRACTICAL	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION:

This course is designed to impart knowledge on synthesis of various organic compounds and qualitative analysis of various functional groups and preparation of stereo models.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Accomplish knowledgeon synthesis of compounds with pharmaceutical importance

CO2. Perform qualitative analysis of compounds with diverse functional groups

CO3. Work as an individual and as a member of a team to solve problems with effective communications.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	2	2	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-	-	2	-	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-	2	-	-	-
Course Correlation Mapping	**3**	**3**	-	**-**	-	-	-	**-**	3	**3**	-	-	**2**	**-**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

I. Introduction to the various laboratory techniques through demonstration involving synthesis of the following compounds (at least 8 compounds to be synthesized):

1. Acetanilde / aspirin (Acetylation)

2. Benzanilide / Phenyl benzoate (Benzoylation)

3. P-bromo acetanilide / 2,4,6 – tribromo aniline (Bromination)

4. Dibenzylidene acetone (Condensation)

5. 1-Phenylazo-2-napthol (Diazotisation and coupling)

6. Benzoic acid / salicylic acid (Hydrolysis of ester)

7. M-dinitro benzene (Nitration)

8. 9, 10 – Antharaquinone (Oxidation of anthracene) / preparation of benzoic acid from toluene or benzaldehyde

9. M-phenylene diamine (Reduction of M-dinitrobenzene) / Aniline from nitrobenzene

10. Benzophenone oxime

11. Nitration of salicylic acid

12. Preparation of picric acid

13. Preparation of O-chlorobenzoic acid from O-chlorotolune

14. Preparation of cyclohexanone from cyclohexanol

II. Identification of organic compounds belonging to the following classes by : Systematic qualitative organic analysis including preparation of derivatives Phenols, amides, carbohydrates, amines, carboxylic acids, aldehyde and ketones, Alcohols, esters, hydrocarbons, anilides, nitrocompounds.

III. Introduction to the use of stereo models: Methane, Ethane, Ethylene, Acetylene, Cis alkene, Trans alkene, inversion of configuration.

RESOURCES

BOOKS:

1 Practical Organic Chemistry by Mann & Saunders, Pearson Education India; 4th edition (1 January 2009).

2 A. H. Beckett and J. B. Stanlake's Practical Pharmaceutical chemistry Vol -I & Vol-II

3 Practical Organic Chemistry, Ajay Kumar, Books and Allied Private Limited.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=WkawbF-yHME
2. https://www.youtube.com/watch?v=2-v9JUBLXKc
3. https://www.youtube.com/watch?v=hFBsnZavUuw
4. https://www.youtube.com/watch?v=Oca5ytegZyY

WEB RESOURCES:

1. https://rushim.ru/books/praktikum/Mann.pdf
2. https://books-library.net/files/download-pdf-ebooks.org-kupd-1992.pdf
3. https://ia800206.us.archive.org/19/items/TextbookOfPracticalOrganicChemistry5thEd/VogelPracticalOrganicChemistry5thEditionnewfoundV_text.pdf

Course Code	Course Title	L	T	P
23PA205005	**PHARMACEUTICAL INORGANIC CHEMISTRY PRACTICAL**	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION:

This course is designed to impart knowledge on limit tests and identification of various inorganic compounds, test for purity and preparation of pharmaceutical compounds.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Accomplish knowledge on limit tests of ions and identification tests of diverse inorganic compounds.

CO2. Perform and analyse the preparation & test of purity of diverse pharmaceutical compounds.

CO3. Work as an individual and as a member of a team to solve problems with effective communications.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-	2	-	-	-
Course Correlation Mapping	**3**	**1**	-	**-**	-	-	-	**-**	3	**3**	-	-	**2**	**-**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

LIST OF EXPERIMENTS.

1. Limit test (6 exercises)
a. Limit test for chlorides
b. Limit test for sulphates
c. Limit test for iron
d. Limit test for heavy metals
e. Limit test for arsenic
f. Modified limit tests for chlorides and sulphates.

2. Assays (10 exercises)
a. Ammonium chloride- Acid-base titration
b. Ferrous sulphate- Cerimetry
c. Copper sulpahte- Iodometry
d. Calcium gluconate- Complexometry
e. Hydrogen peroxide – Permanganometry
f. Sodium benzoate – Nonaqueous titration
g. Sodium chloride – Modified volhard's method
h. Assay of KI – KIO3 titration
i. Gravimetric estimation of barium as barium sulphate
j. Sodium antimony gluconate or antimony potassium tartarate

3. Estimation of Mixtures
a. Sodium hydroxide and sodium carbonate
b. Boric acid and borax
c. Oxalic Acid and Sodium oxalate

4. **Test for identity (Any three exercises)**
a. Sodium bicorbonate
b. Barium sulphate
c. Ferrous sulphate
d. Potassium chloride.

5**. Test for purity (Any two exercises)**
a. Swelling power in Bentonite
b. Acid neutralising capacity in aluminium hydroxide gel
c. Ammonium salts in potash alum
d. Adsorption power heavy Kaolin
e. Presence of Iodates in KI

6**. Preparations (Any two exercises)**
a. Boric acids
b. Potash alum
c. Calcium lactate
d. Magnesium suphate

RESOURCES

BOOKS:

1 A text book Inorganic medicinal chemistry by Surendra N. Pandeya

2 A. H. Beckett and J. B. Stanlake's Practical Pharmaceutical chemistry Vol -I & Vol-II

3 Inorganic Pharmaceutical Chemistry III-Edition P. Gundu Rao

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc23_cy02/preview
2. https://www.youtube.com/watch?v=OUj4j6td1es
3. https://www.youtube.com/watch?v=hlL0LIKfVvw
4. https://www.youtube.com/watch?v=a4bcGvd-vps

WEB RESOURCES:

1. https://www.t.soka.ac.jp/chem/iwanami/inorg/INO_0001.PDF
2. https://www.chemcome.com/wp-content/uploads/2020/11/Principles-of-inorganic-chemistry-by-Pfennig-Brian-William-z-lib.org_.pdf
3. https://handoutset.com/wp-content/uploads/2022/07/Basic-Concepts-Of-Inorganic-Chemistry-D.N.-Singh-.pdf
4. https://rushim.ru/books/neorganika/Chambers.pdf

Course Code	Course Title	L	T	P
23PY205001	**REMEDIAL BIOLOGY PRACTICAL**	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION:

This course is designed to impart knowledge on study of leaves, stem and roots and identify fruits and seeds, animals and detailed study on frog using computer-based tutorials.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyse the morphology and histology of plants

CO2. Apply appropriate method and analyse the simulations of animals

CO3. Work independently and in teams to solve problems with effective communication

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-	2	-	-	-
Course Correlation Mapping	**3**	**3**	-	**-**	-	-	-	**-**	3	**3**	-	-	**2**	**-**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

LIST OF EXPERIMENTS

1. Introduction of biology experiments
2. Study of cell wall constituents and cell inclusions
3. Study of Stem modifications
4. Study of Root modifications
5. Study of Leaf modifications
6. Identification of Fruits and seeds
7. Preparation of Permanent slides
8. T.S. of Senna, Cassia, Ephedra, Podophyllum.
9. Simple plant physiological experiments
10. Identification of animals
11. Detailed study of Frog
12. Computer based tutorials

RESOURCES

BOOKS:

1 Outlines of Zoology by M. Ekambaranatha Iyyer and T. N. Anantakrishnan

2 A manual for pharmaceutical biology practical by S. B. Gokhale and C. K. Kokate

3 Practical Inorganic Chemistry by Shikha Gulati , CBS Publishers and Distributors Pvt Ltd (29 March 2019)

VIDEO LECTURES:

1. https://www.youtube.com/playlist?list=PLlCSanxO4a9FNVnMxUpzhHkyMnMUmAMkY

WEB RESOURCES:

1. https://www.studocu.com/in/document/rajiv-gandhi-university-of-health-sciences/pharmacy/remedial-biology-practical-mannual/18552640

II YEAR

Course Code	Course Title	L	T	P
23PP201001	PATHOPHYSIOLOGY	3	1	-
Pre-Requisite	-			
Anti-Requisite	-			
Co-Requisite	-			

COURSE DESCRIPTION:

Upon completion of this course the student be able to understand the relevant aspects of pathology of various disease conditions with reference to their management, and understanding of basic Pathophysiological mechanisms.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1.	After successful completion of the course, students will be able to analyze the causes, pathogenesis, and morphology of cell injury, including abnormalities in glycogen storage diseases.
CO2.	explain the pathogenesis of acute inflammation, identify chemical mediators, and understand the types of chronic inflammation and wound repair processes.
CO3.	gain insights into immunological diseases, including hypersensitivity types, autoimmunity mechanisms, transplantation antigens, and acquired immune deficiency syndrome (AIDS).
CO4.	distinguish between benign and malignant tumors, understand histological diagnoses, and explain tumor invasions, metastasis, and general tumor biology.
CO5.	understand environmental and nutritional diseases, including the effects of pollution, shock types and management, and pathogenesis of conditions such as malnutrition and obesity.
CO6.	equipped to discuss the pathophysiology of common diseases, including Parkinsonism, schizophrenia, hypertension, diabetes mellitus, and various infectious diseases.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	2	-	-	-	-	-	2	-	-	-	2	-	3	-	-
CO6	3	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
Course Correlation Mapping	2.5	2.1	-	-	-	-	-	2	-	-	-	2	-	2.5	-	-

Correlation Levels: **3: High; 2: Medium; 1: Low**

COURSE CONTENT

Module 1:	**CELL INJURY AND INFLAMMATION**	**(10 Periods)**

1. Basic principles of cell injury and Adaptation
   a) Causes, Pathogenesis and morphology of cell injury
   b) Abnormalities in lipoproteinaemia, glycogen infiltration and glycogen infiltration and glycogen infiltration and glycogen storage diseases.

   Inflammation
   a) Pathogenesis of acute inflammation, Chemical mediators in inflammation, Types of chronic inflammation
   b) Repairs of wounds in the skin, factors influencing healing of wounds.

Module 2:	**IMMUOLOGICAL DISEASES**	**(15 Periods)**

1. Diseases of Immunity
   a) Introduction to T and B cells
   b) MHC proteins or transplantation antigens
   c) Immune tolerance
   - Hypersensitivity: Hypersensitivity type I, II, III, IV, Biological significance, Allergy due to food,chemicals and drugs
   - Autoimmunity

   Criteria for autoimmunity, Classifications of autoimmune diseases in man, mechanism of autoimmunity, Transplantation and immunologic tolerance, allograft rejections, transplantation antigens, mechanism of rejection of allograft.
   - Acquired immune deficiency syndrome (AIDS), Amyloidosis.

Module 3:	**ONCOLOGY**	**(10 Periods)**

1. Cancer: differences between benign and malignant tumors, Histological diagnosis of malignancy, invasions and metastasis, patterns of spread, disturbances of growth of cells, classification of tumors, general biology of tumors, spread of malignant tumors, etiology and pathogenesis of cancer.

Module 4:	**ENVIROMENTAL AND NUTRITIONAL DISEASES**	**(13 Periods)**

1. Types of shock, mechanisms, stages and management
2. Biological effects of radiation
3. Environmental and nutritional diseases

i) Air pollution and smoking- SO_2, NO, NO_2, and CO

ii) Protein calorie malnutrition, vitamins, obesity, pathogenesis of starvation.

Module 5:	**PATHOPHYSIOLOGY OF COMMON DISEASES**	**(15 Periods)**

a) Parkinsonism
b) Schizophrenia
c) Depression and mania
d) Hypertension,
e) Stroke (ischaemic and hemorrhage)
f) Angina, CCF, Atherosclerosis, Myocardial infarction
g) Diabetes Mellitus
h) Peptic ulcer and inflammatory bowel diseases

i) Cirrhosis and Alcoholic liver diseases j) Acute and chronic renal failure **k)** Asthma and chronic obstructive airway diseases		
Module 6:	**INFECTIOUS DISEASES**	**(10 Periods)**
Sexually transmitted diseases (HIV, Syphilis, Gonorrhea), Urinary tract infections, Pneumonia, Typhoid, Tuberculosis, Leprosy, Malaria Dysentery (bacterial and amoebic), Hepatitis- infective hepatitis.		
		(Total 75 Periods)

RESOURCES

BOOKS:	
1. Kumar, V., Abbas, A. K., & Aster, J. C. (2017). Robbins Basic Pathology (10th ed.). Elsevier - Health Sciences Division.	
2. MOHAN, Harsh. (2013). *Pathology Practical Book* (Ed. 3, cet. 1). New Delhi: Jaypee Brothers Medical.	
3. Hubert, & Vanmeter. (2017). Gould's pathophysiology for the health professions (6th ed.). Saunders.	
4. Porth, C., & Matfin, G. (2009). Pathophysiology: Concepts of altered health states (8th ed.). Wolters Kluwer Health/Lippincott Williams & Wilkins.	
5. McCance, K. L., & Huether, S. E. (2010). Pathophysiology: The biologic basis for disease in adults and children (6th ed.). Mosby Elsevier.	
VIDEO LECTURES:	
	https://www.youtube.com/watch?v=rkkDtwItWDk
2.	https://www.youtube.com/watch?v=rtPQHDWg-6M
3.	https://www.youtube.com/watch?v=vNjkKg-hk3k
Web Resources:	
	http://repository.stikesrspadgs.ac.id/104/1/Study%20Guide%20for%20Understanding%20Pathophysiology-345hlm.pdf
2.	https://peersinpatho.com/wp-content/uploads/2021/06/Pathophysiology-Notes-full-document-2.pdf
3.	http://repo.upertis.ac.id/1818/1/ESSENTIALS%20of%20PATHOPHYSIOLOGY%20for%20PHARMACY.pdf
4.	http://repository.stikesrspadgs.ac.id/103/1/Pathophysiology%20for%20the%20Health%20Professions-737hlm.pdf

Course Code		**L**	**T**	**P**	**C**

23PH201009	PHARMACEUTICAL MICROBIOLOGY	3	1		4
Pre-Requisite	-				
Anti-Requisite	-				
Co-Requisite	-				

COURSE DESCRIPTION: This course deals with the various aspects of microorganisms, its classification, morphology, laboratory cultivation identification and maintenance. Its also discusses with sterilization of pharmaceutical products, equipment, media etc. The course further discusses the immunological preparations, diseases its transmission, diagnosis, control and immunological tests.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1.	describe the major divisions of the microbial world and classify bacteria, fungi, viruses, and other microbes.
CO2.	proficient in bacterial growth, including nutritional requirements and cultivation, and will master methods for isolating and identifying microbes using staining and biochemical techniques.
CO3.	understand various sterilization and disinfection methods, their applications, and limitations, and will evaluate the effectiveness of disinfectants and preservatives in pharmaceutical preparations.
CO4.	explain immunology principles, including natural and acquired immunity, antigen-antibody reactions, and the significance of immunization programs and booster doses.
CO5.	conduct microbial sensitivity testing and diagnostic tests, including assays for antibiotics and vitamins, and perform techniques such as Elisa, Western Blot, and PCR.
CO6.	identify and understand the pathophysiology of infectious diseases such as Typhoid, Tuberculosis, Malaria, Cholera, Hepatitis, Meningitis, Syphilis, Gonorrhea, and HIV.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	1	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	3	-	-	-	-	-	-	-	3	-	2	-	-
CO6	2	3	-	-	-	-	-	-	-	-	-	2	-	2	-	-
Course Correlation Mapping	2.3	2	2	3	-	2	-	-	-	-	-	2.5	-	2	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: MICROBIOLOGY (14 Periods)

Introduction to the science of microbiology. Major divisions of microbial world and Relationship among them.
Classification of microbes- Different methods of classification of microbes and study of Bacteria, Fungi, virus, Rickettsiae, Spirochetes.

Module 2: GROWTH, ISOLATION AND IDENTIFICATION OF MICROBES (11 Periods)

Bacterial growth
Nutritional requirements, growth and cultivation of bacteria and virus. Study of different important media required for the growth of aerobic and anaerobic bacteria & fungi. Differential media, enriched media and selective media, maintenance of lab cultures.
Isolation and identification of microbes
Different methods used in isolation and identification of bacteria with emphasis to different staining techniques and biochemical reactions. Counting of bacteria -Total and Viable counting techniques.

Module 3: STERILIZATION AND DISINFECTION (15 Periods)

Detailed study of different methods of sterilization including their merits and demerits. Sterilization methods for all pharmaceutical products. Detailed study of sterility testing of different pharmaceutical preparations. Brief information on Validation.
Disinfectants- Study of disinfectants, antiseptics, fungicidal and virucidal agents factors affecting their activation and mechanism of action. Evaluation of bactericidal, bacteristatic, virucidal activities, evaluation of preservatives in pharmaceutical preparations.

Module 4: IMMUNOLOGY (10 Periods)

Immunology- Immunity, Definition, Classification, General principles of natural immunity, Phagocytosis, acquired immunity (active and passive). Antigens, chemical nature of antigens structure and formation of Antibodies, Antigen-Antibody reactions. Bacterial exotoxins and endotoxins. Significance of toxoids in active immunity, Immunization Programme, and importance of booster dose.

Module 5: SENSITIVITY TESTS AND DIAGNOSTIC TESTS (15 Periods)

Sensitivity testing of microbes
Microbial culture sensitivity Testing: Interpretation of results Principles and methods of different microbiological assays, microbiological assay of Penicillin, Streptomycin and vitamin B2 and B12. Standardization of vaccines and sera.
Diagnostic tests
Schick's Test, Elisa test, Western Blot test, Southern Blot PCR Widal, QBC, Mantaux Peripheral smear. Study of malarial parasite.

Module 6: INFECTIOUS DISEASES (10 Periods)

Study of infectious diseases: Typhoid, Tuberculosis, Malaria, Cholera, Hepatitis, Meningitis, Syphilis & Gonorrhea and HIV.

(Total 75 Periods)

RESOURCES

REFERENCES:	
1.	Forbisher, (Year). Fundamentals of Microbiology. Philadelphia: W.B. Saunders.
2.	Prescot, L.M., Jarley, G.P., & Klein, D.A. (Year). Microbiology (2nd edition). New York, NY: McGraw-Hill Education.
3.	Rawlins, E.A. (Year). Bentley's Textbook of Pharmaceutics. London: Bailliere Tindals.
4.	Prescot, L.M., Jarley, G.P., & Klein, D.A. (Year). Microbiology (2nd edition). Oxford: WMC Brown Publishers.
VIDEO LECTURES:	
1.	https://www.youtube.com/watch?v=1HeW32AoxoA
2.	https://youtu.be/sNfuZ03uH6Y?si=-ZUqfORE4jV-bLI7
WEB RESOURCES:	
1.	Pharmacopoeia of India, Govt of India, 1996.
2.	War Roitt, Jonathan Brostoff, David male, — Immunology‖3rd edition 1996, Mosby-year book Europe Ltd, London.

Course Code	Course Title	L	T	P

23PY201004	PHARMACOGNOSY AND PHYTOPHARMACEUTICALS	3	1	-
Pre-Requisite	-			
Anti-Requisite	-			
Co-Requisite	-			

COURSE DESCRIPTION: This course is designed to impart fundamental knowledge on medicinal uses of various naturally occurring drugs history, sources, distribution, method of cultivation, active constituents, medicinal uses, identification tests, preservation methods, substitutes, and adulterants.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1.	Demonstrate a thorough understanding of the fundamentals of Pharmacognosy.
CO2.	Acquire knowledge about the cultivation, collection, and processing of crude drugs.
CO3.	Understand the cellular components and their role in the preparation of surgical dressings.
CO4.	Conduct microscopical and powder analysis of various crude drugs.
CO5.	Gain a comprehensive understanding of the chemistry, classification, and analysis of carbohydrates and proteins.
CO6.	Demonstrate knowledge of the sources, extraction methods, chemistry, and analysis of lipids, including a detailed study of oils.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	2	-	-	-	-	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	2	2	-	-	-	-	-	2	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Course Correlation Mapping	2.5	-	-	-	-	2	2	-	-	-	-	-	2.3	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1:	INTRODUCTION TO PHARMACOGNOSY, CLASSIFICATION OF CRUDE DRUGS & DRUG ADULTERATION.	(10 Periods)

- Introduction.
- Definition, history, and scope of Pharmacognosy.
- Alphabetical classification
- Taxonomical classification
- Morphological classification
- Pharmacological classification
- Chemical classification
- Chemotaxonomical classification
- Serotaxonomical classification
- Different methods of adulteration of crude drugs.

MODULE 2:	**CULTIVATION, COLLECTION, AND PROCESSING OF CRUDE DRUGS & NATURAL PESTICIDES.**	**(15 Periods)**

- Cultivation Methods
- Factors Affecting Cultivation
- Collection of Crude Drugs
- Harvesting of Crude Drugs
- Drying of Crude Drugs
- Garbling (Dressing)
- Storage of Crude Drugs
- Natural pesticides.

MODULE 3:	**CELL CONSTITUENTS, CELL INCLUSIONS & SURGICAL DRESSINGS.**	**(10 Periods)**

- Study of cell wall constituents and cell inclusions.
- Detailed study of various cell constituents.
- Study of plant fibers used in surgical dressings and related products.

MODULE 4:	**MICROSCOPICAL AND POWDER MICROSCOPICAL STUDY OF CRUDE DRUGS.**	**(15 Periods)**

- Powder and microscopic study of Datura.
- Powder and microscopic study of Senna.
- Powder and microscopic study of Cassia and cinnamon.
- Powder and microscopic study of Cinchona.
- Powder and microscopic study of Clove
- Powder and microscopic study of Fennel.
- Powder and microscopic study of Coriander.
- Powder and microscopic study of Nux vomica.

MODULE 5:	**CARBOHYDRATES AND PROTEINS**	**(15 Periods)**

- Carbohydrates and related products.
- Detailed study of carbohydrates containing drugs. (11 drugs)
- Definition, classification, chemistry, and method of analysis of protein.

MODULE 6:	**LIPIDS**	**(10 Periods)**

- Definition sources, method extraction, chemistry, and method of analysis of lipids.
- Detailed study of oils.

Total Periods: 75

RESOURCES:

BOOKS:

1. Pharmacognosy by G.E. Trease & W.C. Evans.
2. Pharmacognosy by C.K.Kokate, Gokhale & A.C. Purohit.
3. Pharmacognosy by Brady &Tyler. E.
4. Pharmacognosy by T.E.Wallis.
5. Pharmacognosy by C.S. Shah & Qadery.
6. Pharmacognosy by M.A. Iyengar.

VIDEO LECTURES:

1 https://www.youtube.com/watch?v=wYB04tuFNnI

2. https://www.youtube.com/watch?v=NpukQtaAIls
3. https://youtu.be/HR9KHW-e0pY
4. https://youtu.be/dFrx-t5J0PA
5. https://youtu.be/8Syg1qmblpM

Web Resources:

1 http://docs.neu.edu.tr/staff/ali.mericli/1a-Carbohydrates_4.pdf

2. https://www.pharmacy180.com/article/proteins-336/#:~:text=A%20protein%20is%20a%20complex,function%20of%20all%20living%20cells.

Course Code	Course Title	L	T	P	C

23PC201002	**PHARMACOLOGY-I**	**3**	**1**	**-**	**-**
Pre-Requisite		-			
Anti-Requisite					
Co-Requisite					

COURSE DESCRIPTION: The main purpose of the subject is to understand what drugs do to the living organisms and how they are explored in the treatment of diseases. The subject covers the information about the drugs such as mechanism of action (Pharmacodynamics), as well as absorption, distribution, metabolism and excretion (Pharmacokinetics) along with side effects and clinical applications.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1.	Understand pharmacology principles, including drug administration routes, pharmacokinetics, pharmacodynamics, drug toxicity, and the importance of pre-clinical evaluations.
CO2.	Learn autonomic pharmacology with focus on adrenergic, anti-adrenergic, cholinergic, anti-cholinergic drugs, neuromuscular blockers, and treatments for myasthenia gravis and Parkinsonism.
CO3.	Describe cardiovascular pharmacology including anti-hypertensives, anti-anginal drugs, anti-arrhythmics, drugs for heart failure, and treatments for hyperlipidaemias.
CO4.	Comprehend central nervous system pharmacology, covering general anesthetics, sedatives, hypnotics, anticonvulsants, analgesics, psychotropic drugs, and CNS stimulants.
CO5.	Master respiratory pharmacology with knowledge on bronchodilators, mucolytics, expectorants, anti-tussives, nasal decongestants, and autocoids like histamines and serotonin.
CO6.	Grasp endocrine pharmacology, focusing on thyroid and antithyroid drugs, insulin, oral hypoglycemic agents, sex hormones, oral contraceptives, and oxytocin-related treatments.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO4	3	2	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO5	3	2	-	2	-	-	-	-	-	-	-	-	-	2	-	-
CO6	3	2	-	2	-	-	-	-	-	-	-	-	-	2	-	-
Course Correlation Mapping	2.7	2	3	2	-	-	-	-	-	-	-	-	-	2	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1:	General Pharmacology	(10 Periods)

a) Introduction, definitions and scope of pharmacology.

b) Routes of administration of drugs.

c) Pharmacokinetics (absorption, distribution, metabolism and excretion).

d) Pharmacodynamics.

e) Factors modifying drug effects.

f) Drug toxicity - Acute, sub- acute and chronic toxicity.

g) Pre-clinical evaluations.

Module 2:	Autonomic Pharmacology	(15 Periods)

a) Adrenergic and anti-adrenergic drugs.

b) Cholinergic and anti-cholinergic drugs.

c) Neuromuscular blockers.

d) Mydriactics and miotics.

e) Drugs used in myasthenia gravis.

f) Drugs used in Parkinsonism.

Module 3:	CARDIOVASCULAR PHARMACOLOGY	(11 Periods)

a) Anti-hypertensives

b) Anti-anginal drugs

c) Anti-arrhythmic drugs

d) Drugs used for therapy of Congestive Heart Failure

e) Drugs used for hyperlipidaemias

Module 4:	CENTRAL NERVOUS SYSTEM PHARMACOLOGY	(14 Periods)

a) General anesthetics

b) Sedatives and hypnotics

c) Anticonvulsants

d) Analgesic and anti- inflammatory agents

e) Psychotropic drugs

f) Alcohol and methyl alcohol

g) CNS stimulants and cognition enhancers

h) Pharmacology of local anaesthetics

Module 5:	RESPIRATORY PHARMACOLOGY AND AUTOCOIDS	(15 Periods)

Pharmacology of respiratory system

Bronchodilators, Mucolytics, Expectorants, Antitussives and Nasal decongestants.

Pharmacology of autocoids and their antagonists

a) Histamines and Anti-histaminics.

b) 5-Hydroxytryptamine and its antagonists.

c) Lipid derived autocoids and platelet activating factor.

Module 6:	ENDOCRINE PHARMACOLOGY	(10 Periods)

Pharmacology of Hormones and Hormone antagonists

a) Thyroid and Antithyroid drugs.

b) Insulin, Insulin analogues and oral hypoglycemic agents.

c) Sex hormones and oral contraceptives.

d) Oxytocin and other stimulants and relaxants.

(Total Periods: 75)

RESOURCES

TEXT BOOKS:	
1.	K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd New Delhi.

2.	Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
3.	Goodman and Gilman's, The Pharmacological Basis of Therapeutics
VIDEO LECTURES:	
1.	https://www.youtube.com/watch?v=e2pM930x9xw
2.	https://www.youtube.com/watch?v=ECEJrTjwgNw
3.	https://www.youtube.com/watch?v=NchhDVZHGKs
WEB RESOURCES:	
1.	http://www2.hsc.wvu.edu/som/physio/classes/pcol260/pdf/about_pcol260.pdf
2.	https://study.com/academy/lesson/pharmacy-drug-databases-web-resources.html
3.	https://study.com/academy/lesson/pharmacy-drug-databases-web-resources.html

Course Code	Course Title	L	T	P
23PP201002	**COMMUNITY PHARMACY**	2	1	-
Pre-Requisite	-			
Anti-Requisite	-			
Co-Requisite	-			

COURSE DESCRIPTION: This course is designed to impart a fundamental knowledge on formulating different types of dosage forms, their formulation aspects and pharmaceutical calculation involved. Formulate different types of dosage forms; and appreciate the importance of good formulation.
COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1.	Understand community pharmacy management, including site selection, layout, staff management, legal requirements, and computer usage in business and healthcare.
CO2.	Analyze prescriptions and identify medication-related problems, focusing on drug interactions and the principles of pharmaceutical care.
CO3.	Analyze prescriptions and identify medication-related problems, focusing on drug interactions and the principles of pharmaceutical care.
CO4.	Master patient counseling techniques and inventory control methods, including ABC, VED, EOQ, and safety stock.
CO5.	Implement community pharmacy services, including essential drugs, medication adherence strategies, health screenings, and OTC medication counseling.
CO6.	Educate on health promotion, care for various demographics, communicable diseases, balanced diets, and family planning roles of pharmacists.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	2	-	-	-	-	-	-	-	-	-	2
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CO5	3	2	-	-	-	-	-	2	-	-	-	2	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	3	-	2	-	-	-	-
Course Correlation Mapping	2.7	2.5	2	-	-	2	-	2	-	3	2	2	-	-	-	2

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1:	**COMMUNITY PHARMACY AND ITS MANAGEMENT**	**12 Periods**
Definition, scope, of community pharmacy; Roles and responsibilities of Community		

pharmacist.

Community pharmacy management

a) Selection of site, Space layout, and design.
b) Staff, Materials- coding, stocking.
c) Legal requirements.
d) Maintenance of various registers.
e) Use of Computers: Business and health care softwares.

MODULE 2:	PRESCRIPTION AND PHARMACEUTICAL CARE	08 Periods

Parts of prescription, legality & identification of medication related problems like drug interactions.

Definition and Principles of Pharmaceutical care.

MODULE 3:	PATIENT COUNSELING AND INVENTORY CONTROL	08 Periods

Patient counseling

Definition, outcomes, various stages, barriers, Strategies to overcome barriers,
Patient information leaflets- content, design, & layouts, advisory labels.

Inventory control

Definition, various methods of Inventory Control ABC, VED, EOQ, Lead time, safety stock.

MODULE 4:	COMMUNITY PHARMACY SERVICES	12 Periods

Essential drugs concept

Essential Drugs concept and Rational Drug Therapy - Role of community pharmacist.

Patient medication adherence

Definition, Factors affecting medication adherence, role of pharmacist in improving the adherence.

Health screening services

Definition, importance, methods for screening, Blood pressure/ blood sugar/ lung function and Cholesterol testing

OTC medication

Definition, OTC medication list & Counselling.

Code of ethics for community pharmacists.

MODULE 5:	HEALTH EDUCATION	12 Periods

WHO Definition of health and health promotion, care for children, pregnant & breast-feeding women, and geriatric patients.

Commonly occurring Communicable Diseases, causative agents, Clinical presentations and prevention of communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy, Syphilis, Gonorrhea and AIDS.

Balance diet, and treatment & prevention of deficiency disorders

Family planning – role of pharmacist.

MODULE 6:	MINOR AILMENTS MANAGEMENT	08 Periods

Relevant pathophysiology, common drug therapy to Pain, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhea and constipation), Pyrexia, Opthalmic symptoms, worm infestations.

(Total 60 Periods)

RESOURCES:

BOOKS:	
1.	Health Education and Community Pharmacy by N. S. Parmar.

2	WHO consultative group report.
3	Drug store & Business management by Mohammed Ali & Jyoti.
4	Handbook For Community Pharmacists by Atmaram Pawar, Career Publications.
5	Handbook of pharmacy – Health care. Edt. Robin J Harman. The Pharmaceutical press.
6	Comprehensive Pharmacy Review – Edt. Leon Shargel. Lippincott Williams & Wilkins.
VIDEO LECTURES:	
1	https://youtu.be/maIrUdbm3jw
2.	https://youtu.be/3OuiWb7jDKI
3.	https://youtu.be/O5GWBwowecI
4.	https://youtu.be/-weNeW6JfsQ
5.	https://youtu.be/js_VZ1pHmCE
Web Resources:	
1	https://www.iajps.com/pdf/april2018/138.IAJPS138042018.pdf
2.	https://bspublications.net/downloads/04fc74e29bccd5_Community%20Pharmacy%20Basic%20Principles_INTRODUCTION%20AND%20COMMUNITY%20PHARMACY%20MANAGEMENT.pdf

Course Code	Course Title	L	T	P
23PP201003	**PHARMACOTHERAPEUTICS – I**	3	1	-
Pre-Requisite	-			
Anti-Requisite	-			
Co-Requisite	-			
COURSE DESCRIPTION: This course is designed to impart knowledge and skills necessary				

for imparting safe and effective use of medicines in patients. They also learn pharmacotherapy of diseases with etiopathogenesis, diagnostic criteria and drug therapy management practices. This also helps to understand and practice evidence-based medicine during disease management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1	Define rational drug use, understand essential drug concepts, and evaluate the pharmacist's role in drug formulation and management effectively.
CO2	Assess and manage conditions like hypertension, heart failure, angina, myocardial infarction, hyperlipidemia, and arrhythmias using appropriate cardiovascular treatments.
CO3	Interpret pulmonary function tests and manage asthma, chronic obstructive airway disease, and drug-induced pulmonary diseases with effective therapeutic strategies.
CO4	Diagnose and treat ophthalmic conditions such as glaucoma and conjunctivitis, differentiating between viral and bacterial causes and appropriate treatments.
CO5	Manage endocrine disorders including diabetes, thyroid diseases, osteoporosis, and hormone therapies, including the use of oral contraceptives.
CO6	Apply prescribing guidelines for pediatric, geriatric, pregnant, and breastfeeding patients, ensuring safe and appropriate medication use across different populations.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	-	2	-	-	-	-	-	-	-	-	2	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO5	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO6	2	2	-	-	2	-	-	-	-	-	-	-	-	2	-	-
Course Correlation Mapping	2.5	2	3	-	2	-	-	-	-	-	-	-	-	2	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1	**RATIONAL DRUG USE**	**(05 Periods)**
Definition, Role of pharmacist in essential drug concept and rational drug formulations		
Module 2	**CARDIOVASCULAR SYSTEM**	**(20 Periods)**

Hypertension, Congestive cardiac failure, Angina Pectoris, Myocardial infarction, Hyperlipidemias, Electrophysiology of heart and Arrhythmias.		
Module 3	**RESPIRATORY SYSTEM**	**(15 Periods)**
Introduction to Pulmonary function test, Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases.		
Module 4	**Ophthalmology**	**(10 Periods)**
Glaucoma, Conjunctivitis- viral & bacteria.		
Module 5	**Endocrine system**	**(15 Periods)**
Diabetes, Thyroid diseases, Oral contraceptives, Hormone replacement therapy, Osteoporosis.		
Module 6	**PRESCRIBING GUIDELINES**	**(10 Periods)**
Prescribing guidelines a. Pediatric patients b. Geriatric patients c. Pregnancy and breast feeding.		
		(Total periods 75)

RESOURCES

REFERENCES:	
1	Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange
2	Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda -Kimble MA
3	Harrison's Principles of Internal Medicine, Twentieth Edition (Vol.1 & Vol.2) 20th Edition: - Volume I & Volume II

4	API Textbook of Medicine (2 Volumes)
VIDEO LECTURES:	
1.	https://world-heart-federation.org/resource/video-hypertension/
2.	https://www.youtube.com/watch?v=ovv8intb9kY
3.	https://www.youtube.com/watch?v=XBg6hxGgyS4
4.	https://www.youtube.com/watch?v=-B-RVybvffU
WEB RESOURCES:	
1.	https://app.pulsenotes.com/medicine/cardiology/notes
2.	https://app.pulsenotes.com/medicine/endocrinology/notes
3.	https://app.pulsenotes.com/medicine/opthalmology/notes

Course Code	PHARMACEUTICAL MICROBIOLOGY PRACTICAL	L	T	P	C
23PH205004		0		4	2
Pre-Requisite	-				
Anti-Requisite	-				
Co-Requisite	-				
COURSE DESCRIPTION:					
COURSE OUTCOMES: After successful completion of the course, students will be able to:					

CO1. Know the anatomy. Identification, growth factors and sterilization of microorganisms

CO2. Know the mode of transmission of disease-causing microorganism, symptoms of disease and treatment aspect

CO3. Do identification of diseases by performing the diagnostic tests

CO4. Appreciate the behavior of motility and behavioral characteristics of microorganisms

CO-PO Mapping Table:

Course Outcomes	Program Outcomes										Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	-	-	-	-	-	-	-	2	-	-	-
CO2	3	2	3	-	-	-	-	-	-	-	2	-	-	-
CO3	3	2	3	-	-	-	-	-	-	-	2	-	-	-
CO4	3	2	3	-	-	-	-	-	-	-	2	-	-	-
Course Correlation Mapping	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

Course Content

EXPERIMENTAL LEARNING

1 Study of apparatus used in experimental microbiology
2 Sterilization of glass wares. Preparation of media and sterilization.
3 Staining techniques – Simple staining; Gram's staining; Negative staining
4 Study of motility characters.
5 Enumeration of micro-organisms (Total and Viable)
6 Study of the methods of isolation of pure culture.
7 Bio chemical testing for the identification of micro-organisms.
8 Cultural sensitivity testing for some micro-organisms.

9 Sterility testing for powders and liquids.
10 Determination of minimum inhibitory concentration.
11 Microbiological assay of antibiotics by cup plate method.
12 Microbiological assay of vitamins by Turbidimetric method
13 Determination of RWC.
14 Diagnostic tests for some common diseases, Widal, malarial parasite.

Course Code	PHARMACOGNOSY AND PHYTOPHARMACEUTICALS (PRACTICAL)	L	T	P	C
23PY205002		-	-	3	
Pre-Requisite	-				
Anti-Requisite	-				
Co-Requisite	-				
COURSE DESCRIPTION:					
COURSE OUTCOMES: After successful completion of the course, students will be able to:					

CO1. Understand the Macroscopy of crude drugs
CO2. Know the powdered microscopy of crude drugs
CO3. Know the Microscopy of organized crude drugs

CO4. Know about the analysis of unorganized crude drugs

CO-PO Mapping Table:

Course Outcomes	Program Outcomes										Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	2	-	-	-
Course Correlation Mapping	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

Course Content

EXPERIMENTAL LEARNING

1 Introduction of Pharmacognosy laboratory and experiments.
2 Study of cell wall constituents and cell inclusions.
3 Macro, powder, and microscopic study of Datura.
4 Macro, powder, and microscopic study of Senna.
5 Macro, powder and microscopic study of Cassia and cinnamon.
6 Macro, powder, and microscopic study of Cinchona.
7 Macro, powder, and microscopic study of Ephedra.
8 Macro, powder, and microscopic study of Quassia.
9 Macro, powder, and microscopic study of Clove

10 Macro, powder, and microscopic study of Fennel.
11 Macro, powder, and microscopic study of Coriander.
12 Macro, powder, and microscopic study of Isapgol.
13 Macro, powder, and microscopic study of Nux vomica.
14 Macro, powder, and microscopic study of Rauwolfia.
15 Macro, powder, and microscopic study of Liquorice.
16 Macro, powder, and microscopic study of Ginger.
17 Macro, powder, and microscopic study of Podophyllum.
18 Determination of Iodine value.
19 Determination of Saponification value and unsaponifiable matter.
20 Determination of ester value.
21 Determination of Acid value.
22 Chemical tests for Acacia.
23 Chemical tests for Tragacanth.
24 Chemical tests for Agar.
25 Chemical tests for Starch.
26 Chemical tests for Lipids. (castor oil, sesame oil, shark liver oil, bees wax)
27 Chemical tests for Gelatin.

Course Code	Course Title	L	T	P
23PP205001	**PHARMACOTHERAPEUTICS – I**	**-**	**-**	**3**
Pre-Requisite	-			
Anti-Requisite	-			
Co-Requisite	-			
COURSE DESCRIPTION: This course is designed to impart knowledge and skills in developing therapeutic plan and provide pharmaceutical care to the patients using SOAP notes.				

COURSE OUTCOMES: After successful completion of the course, students will be able to:	
CO1.	Demonstrate the treatment goals to the patient;
CO2.	Analyze patient outcome in selection, monitoring and initiation of drug therapies;
CO3.	Provide feedback to clinicians regarding drug related needs.
CO4.	Work independently and in teams to solve problems with effective communications

CO-PO Mapping Table:

Course Outcome	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	2	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3	3	-	2	2	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-	-
Course Correlation Mapping	**3**	**3**	**-**	**2**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

LIST OF EXPERIMENTS:

Hospital postings for a period of at least 50 Periods is required to understand the principles and practice involved in ward round participation and clinical discussion on selection of drug therapy. Students are required to maintain a record of 15 cases observed in the ward and the same should be submitted at the end of the course for evaluation. Each student should present at least two medical cases they have observed and followed in the wards Assessment of drug interactions in the given prescriptions

Assignments:

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases.

A minimum of THREE assignments [1500–2000words] should be submitted for evaluation.
Format of the assignment:
Minimum & Maximum number of pages
Reference(s) shall be included at the end.
Assignment can be a combined presentation at the end of the academic year
It shall be computer draft copy
Name and signature of the student
Time allocated for presentation may be 8+2 Min.

III YEAR

Course Code	Course Title	L	T	P	C
23PC201003	PHARMACOLOGY-II	3	1	-	4

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION:

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the classification, mechanism of drug action and its relevance in the treatment of different diseases.

CO2. Understand the therapeutic applications and adverse effects of drugs including the molecular basis of the mechanisms of action, learning principles of prescribing practices etc.

CO3. Appreciate the importance of pharmacology subject as a basis of therapeutics, and correlate and apply the knowledge therapeutically.

CO4. Apply the knowledge of gene study in the treatment of various diseases.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	2	-	-	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	-	-	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	-	-	3	-
Co4	3	2	-	-	-	-	-	-	-	-	-	2	-	-	3	-
Course Correlation Mapping	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**3**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: Pharmacology of Drugs ***(15 Periods)***

Pharmacology of Drugs acting on Blood and blood forming agents

a) Anticoagulants
b) Thrombolytics and antiplatelet agents
c) Haemopoietics and plasma expanders

Pharmacology of drugs acting on the Renal System

a) Diuretics
b) Antidiuretics.

Drugs acting on GIT:

a) Drugs for peptic ulcer and gastric acidity
b) Anti-emetics
c) Drugs for constipation, diarrhea, Inflammatory Bowel Disease

Module 2: Chemotherapy ***(15 Periods)***

- Introduction
- Sulphonamides and co-trimoxazole
- Penicillins and Cephalosporins
- Tetracyclines and Chloramphenicol
- Macrolides, Aminoglycosides, Polyene& Polypeptide antibiotics
- Quinolines and Fluroquinolones
- Antifungal antibiotics
- Antiviral agents
- Chemotherapy of tuberculosis and leprosy
- Chemotherapy of Malaria
- Chemotherapy of protozoal infections (amoebiasis, Giardiasis)
- Pharmacology of Anthelmintic drugs
- Chemotherapy of cancer (Neoplasms)

Module 3: Immunopharmacology ***(07 Periods)***

Immunopharmacology: Pharmacology of immunosuppressants and stimulants

Principles of Animal toxicology: Acute, sub-acute, and chronic toxicity

Module 4: The dynamic cell: The structures and functions of the components of the cell ***(15 Periods)***

a) Cell and macromolecules: Cellular classification, subcellular organelles, macromolecules,
large macromolecular assemblies
b) Chromosome structure: Pro and eukaryotic chromosome structures, chromatin structure, genome complexity, the flow of genetic information.
c) DNA replication: General, bacterial, and eukaryotic DNA replication.
d) The cell cycle: Restriction point, cell cycle regulators, and modifiers.
e) Cell signaling: Communication between cells and the environment, ion channels,

signal transduction pathways (MAP kinase, P38 kinase, JNK, Ras and PI3-kinase

pathways, biosensors.

Module 5: The Gene: Genome structure and function ***(20 Periods)***

- Gene structure: Organization and elucidation of genetic code.
- Gene expression: Expression systems (pro and eukaryotic), genetic elements that control gene expression (nucleosomes, histones, acetylation, HDACS, DNA binding protein families.
- Transcription and Transcription factors: Basic principles of transcription in pro and eukaryotes. Transcription factors that regulate transcription in pro and eukaryotes.
- RNA processing: rRNA, tRNA, and mRNA processing.
- Protein synthesis: Mechanisms of protein synthesis, initiation in eukaryotes, translation control and post-translation events
- Altered gene functions Mutations, deletions, amplifications, LOH, translocations, trinucleotide repeats, and other genetic abnormalities. Oncogenes and tumor suppressor genes. The gene sequencing, mapping, and cloning of human disease genes. Introduction to gene therapy and targeting.
- Recombinant DNA technology: principles. Processes (gene transfer technology) and applications.

Total Periods: 75

RESOURCES

TEXTBOOKS:

1. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K., & Watson, J.D. (Year). Molecular Biology of the Cell (3rd edition).
2. Bates, A.D., McLennan, A.G., Turner, P.C., & White, M.R.H. (Year). Molecular Biology (2nd edition).
3. Craig, C.R., & Robert. (Year). Modern Pharmacology with Clinical Applications.
4. Crommelin, D.J.A., & Sindelar, R.D. (Year). Pharmaceutical Biotechnology.
5. Lewin, B. (Year). Genes VIII.
6. Lodish, H., Baltimore, D., Berk, A., et al. (Year). Molecular Cell Biology (5th edition).
7. Mycek, M.J., Gelnet, S.B., & Perper, M.M. (Year). Lippincott's Illustrated Reviews: Pharmacology.
8. Rang, H.P., & Dale, M.M. (Year). Pharmacology (4th edition).
9. Satoskar, R.S., & Bhadarkar, S.D. (Year). Pharmacology and Pharmacotherapeutics (16th edition, single volume).
10. Tripathi, K.D. (Year). Essentials of Medical Pharmacology (4th edition).
11. Walsh, G. (Year). Biopharmaceutical: Biochemistry and Biotechnology.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=3BLC0h8nyng
2. https://www.youtube.com/watch?v=1MLUQPS_71A
3. https://www.youtube.com/watch?v=zD_CWMlrb5s
4. https://www.youtube.com/watch?v=Twvk5TtJw8s

WEB RESOURCES:

1. https://ncvbdc.mohfw.gov.in/Doc/Diagnosis-Treatment-Malaria-2013.pdf
2. https://aiimsrishikesh.edu.in/newwebsite/wp-content/uploads/2019/03/1128_Recombinant_DNA_technology.pdf
3. https://aacmanchar.edu.in/zel_teacher/uploads/e_contents/237_20221209085939.pdf

Course Code	Course Title	L	T	P	C
23PA201012	**PHARMACEUTICAL ANALYSIS**	**3**	**1**	**-**	**4**

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION:

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the cGMP aspects in the pharmaceutical industry & the scope of quality certifications applicable to pharmaceutical industries. Appreciate the importance of documentation.

CO2. Understand the chromatographic separation and analysis of drugs.

CO3. Carry out various volumetric and electrochemical titrations.

CO4. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis Perform quantitative & qualitative analysis of drugs using various analytical instruments.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-
CO4	3	2	-	-	--	-	-	-	-	-	-	-	3	-	-	-
Course Correlation Mapping	**3**	**2**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: Quality Assurance ***(15 Periods)***

- Introduction, sources of quality variation, control of quality variation.
- Concept of statistical quality control.
- Validation methods- quality of equipment, validation of equipment, and validation of analytical instruments and calibration.
- GLP, ISO 9000.
- Total quality management, quality review, and documentation.
- ICH- international conference for harmonization guidelines.
- Regulatory control.

Module 2: Chromatography ***(15 Periods)***

- Introduction, history, classification, separation techniques, choice of methods. The following techniques be discussed with relevant examples of pharmaceutical products involving principles and techniques of separation of drugs from excipients.
- **Column Chromatography:** Adsorption column chromatography, Operational technique, frontal analysis and elution analysis. Factors affecting column efficiency, applications and partition chromatography.
- **TLC:** Introduction, principle, techniques, Rf value and applications.
- **PC:** Introduction, principle, types of paper chromatography, preparation techniques, development techniques, applications.
- **Ion-exchange chromatography:** Introduction, principles, types of ion exchange synthetic resins, physical properties, factors affecting ion exchange, methodology and applications.
- **HPLC:** Introduction, theory, instrumentation, and applications.
- **HPTLC:** Introduction, theory, instrumentation, and applications.
- **Gas Chromatography:** Introduction, theory, instrumentation-carrier gases, types of columns, stationary phases in GLC & GSC. DetectorsFlame ionization detectors, electron capture detector, thermal conductivity detector. Typical gas chromatogram, derivatisation techniques, programmed temperature gas chromatography, applications.
- **Electrophoresis:** Principles of separation, equipment for paper and gel electrophoresis, and application. i. Gel filtration and affinity chromatography: Introduction, technique, applications.

Module 3: Electrometric Methods ***(15 Periods)***

- **Electrometric Methods:** Theoretical aspects, instrumentation, interpretation of data/spectra and analytical applications be discussed on the following topics.
- **Potentiometry:** Electrical potential, electrochemical cell, reference electrodes, indicator electrodes, measurement of potential and pH, construction and working of electrodes, Potentiometric titrations, methods of detecting endpoint, Karl Fischer titration.
- **Conductometry:** Introduction, conductivity cell, conductometric titrations and applications.
- **Polarography**: Instrumentation, DME, residual current, diffusion current and limiting current, polarographic wave, Ilkovic's equation, Effect of oxygen on polarographic wave, Polarographic maxima and suppressors and applications.
- **Amperometric Titrations:** Introduction, types of electrodes used, reference and indicator electrode, instrumentation, titration procedure, advantages and disadvantages of Amperometry over potentiometry. Pharma applications.

Module 4: Spectroscopy ***(15 Periods)***

- **Spectroscopy:** Theoretical aspects, instrumentation, elements of interpretation of data/spectra, and application of analytical techniques be discussed on
- **Absorption Spectroscopy:** Theory of electronic, atomic, and molecular spectra. Fundamental laws of photometry, Beer-Lambert's Law, application and its deviation, limitation of Beer law, application of the law to single and multiple component analysis, measurement of equilibrium constant and rate constant by spectroscopy. Spectra of isolated chromophores, auxochromes, bathochromic shift, hypsochromic shift, hyperchromic and hypochromic effect, the effect of solvent on absorption spectra, molecular structure, and infrared spectra. Instrumentation – Photometer, U.V.-Visible spectrophotometer – sources of U.V.-Visible radiations, collimating systems, monochromators, samples cells and following detectors-Photocell, Barrier layer cell, Phototube, Diode array, applications of U.V.-Visible spectroscopy in pharmacy and spectrophotometric titrations.
- **Infrared Spectroscopy**: Vibrational transitions, frequency – structure correlations, Infrared absorption bands, Instrumentation–IR spectrometer – sources of IR, Collimating systems, monochromators, sample cells, sample handling in IR spectroscopy and detectors– Thermocouple, Golay Cells, Thermistor, Bolometer, Pyroelectric detector, Applications of IR in pharmacy
- **Fluorimetric Analysis:** Theory, luminescence, factors affecting fluorescence, quenching. Instrumentation, Applications, fluorescent indicators, the study of pharmaceutically important compounds estimated by fluorimetry.
- **Flame Photometry:** Theory, nebulization, flame and flame temperature, interferences, flame spectrometric techniques, instrumentation and pharmaceutical applications.
- **Atomic Absorption Spectrometry**: Introduction, Theory, types of electrodes, instrumentation, and applications.
- **Atomic Emission Spectroscopy:** Spectroscopic sources, atomic emission spectrometers, photographic and photoelectric detection.

Module 5: NMR & ESR ***(15 Periods)***

- **NMR & ESR (introduction only):** Introduction, theoretical aspects and applications. f. Mass Spectroscopy: (Introduction only) – Fragmentation, types of ions produced mass spectrum and applications.
- **Polarimetry:** (Introduction only) – Introduction to optical rotatory dispersion, circular dichroism, polarimeter.

- **X-RAY Diffraction:** (Introduction only) – Theory, reciprocal lattice concept, diffraction patterns, and applications. i. Thermal Analysis: Introduction, instrumentation, applications, and DSC and DTA.

Total Periods: 75

RESOURCES

TEXTBOOKS:

1. "Textbook of Chemical Analysis" by A.I. Vogel
2. "Instrumental Analysis" by Willard and Merritt
3. "Undergraduate Instrumental Analysis" by James E.
4. "Pharmaceutical Analysis" by Skoog and West
5. "Quantitative Pharmaceutical Analysis" by Jenkins
6. "Quantitative Drug Analysis" by Garrot D.
7. "Textbook of Pharmaceutical Analysis" by Higuchi and Hasen
8. "Textbook of Pharmaceutical Analysis" by K.A. Connors
9. "Textbook of Pharmaceutical Analysis (Practical)" by Beckett & Stenlake
10. "Textbook of Drug Analysis" by P.D. Sethi

VIDEO LECTURES:

1. https://www.khanacademy.org/test-prep/mcat/chemical-processes/separations-purifications/v/gel-electrophoresis
2. https://www.youtube.com/playlist?list=PLEIbY8S8u_DI1WXZtmhFHO_AixRCVeAi9
3. https://www.youtube.com/watch?v=a2FgqSPGLSg

WEB RESOURCES:

1. https://books.google.co.in/books?id=igR_jsqfcowC&printsec=copyright&redir_esc=y#v=onepage&q&f=false
2. https://www.shimadzu.com/an/service-support/technical-support/liquid-chromatography/overview/overview_of_lc.html.
3. https://www.oup.com.au/__data/assets/pdf_file/0019/135073/Chemistry-for-QLD_9780190313395_sample-chapter-13_secure.pdf

Course Code	Course Title	L	T	P
23PP201004	**PHARMACOTHERAPEUTICS – II**	3	1	-
Pre-Requisite	-			
Anti-Requisite	-			
Co-Requisite	-			

COURSE DESCRIPTION: This course is designed to impart knowledge and skills necessary for imparting safe and effective use of medicines in patients. They also learn pharmacotherapy of diseases with etiopathogenesis, diagnostic criteria and drug therapy management practices. This also helps to understand and practice evidence-based medicine during disease management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1	Demonstrate Pharmacotherapeutic principles of Musculoskeletal, Renal, Oncology, Dermatology disorders.
CO2	Analyze Patent specific factors in selection, initiation, monitoring drug therapies
CO3	Understand the prescribing guidelines for special population
CO4	Demonstrate the role of pharmacist in promoting rational drug use

CO-PO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	2	-	-	-	2	-	2	-	-	-	2	-	-
CO2	3	2	-	2	-	-	-	2	-	2	-	-	-	2	-	-
CO3	3	3	-	2	-	-	-	2	-	2	-	-	-	2	-	-
CO4	3	3	-	2	-	-	-	2	-	2	-	-	-	2	-	-
Course Correlation Mapping	**3**	**2**	-	**2**	-	-	-	**2**	-	**2**	-	-	**-**	**2**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1	**Infectious disease**	**(30 Periods)**
Guidelines for the rational use of antibiotics and surgical Prophylaxis, Tuberculosis, Meningitis, Respiratory tract infections, Gastroenteritis, Endocarditis, Septicemia, Urinary tract infections, Protozoal infection- Malaria, HIV & Opportunistic infections, Fungal infections, Viral infections, Gonorrhea and Syphilis.		
Module 2	**Musculoskeletal disorders**	**(10 Periods)**
Rheumatoid arthritis, Osteoarthritis, Gout, Spondylitis, Systemic lupus erythematosus.		
Module 3	**Renal system**	**(13 Periods)**
Acute Renal Failure, Chronic Renal Failure, Renal Dialysis, Drug induced renal disorders.		
Module 4	**Oncology**	**(15 Periods)**
Basic principles of Cancer therapy, General introduction to cancer chemotherapeutic agents, Chemotherapy of breast cancer, leukemia. Management of chemotherapy nausea and emesis.		
Module 5	**Dermatology**	**(07 Periods)**
Psoriasis, Scabies, Eczema, Impetigo		
		Total 75 Periods

RESOURCES

REFERENCES:	
1	Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange
2	Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda -Kimble MA
3	Harrison's Principles of Internal Medicine, Twentieth Edition (Vol.1 & Vol.2) 20th Edition: - Volume I & Volume II
4	API Textbook of Medicine (2 Volumes)
VIDEO LECTURES:	
1.	https://www.youtube.com/watch?v=fv53QZRk4hs
2.	https://www.youtube.com/watch?v=mLfyo4RlpVE
3.	https://www.youtube.com/watch?v=gGS7tddt1XA
4.	https://www.youtube.com/watch?v=jPUzO7BiYac
WEB RESOURCES:	
1.	https://app.pulsenotes.com/medicine/musculoskeletal/notes
2.	https://app.pulsenotes.com/medicine/dermatology/notes
3.	https://app.pulsenotes.com/medicine/infectious-diseases/notes
4.	https://app.pulsenotes.com/medicine/oncology/notes
5.	https://app.pulsenotes.com/medicine/renal/notes

Course Code	Course Title	L	T	P
23PH201010	PHARMACEUTICAL JURISPRUDENCE	2	-	-

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION:

This course exposes the student to several important legislations related to the profession of pharmacy in India. The Drugs and Cosmetics Act, along with its amendments are the core of this course. Other acts, which are covered, include the Pharmacy Act, dangerous drugs, medicinal and toilet preparation Act etc. Besides this the new drug policy, professional ethics, DPCO, patent and design Act will be discussed.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand laws and procedures regarding manufacturing and sale of drugs and dosage forms and acquire knowledge of various schedules and ethical responsibilities of registered pharmacist.
CO2. Practice the Professional ethics;
CO3. Understand the various concepts of the pharmaceutical legislation in India;
CO4. Know the various parameters in the Drug and Cosmetic Act and rules;
CO5. Know the Drug policy, DPCO, Patent and design act;
CO6. Understand the labeling requirements and packaging guidelines for drugs and cosmetics;
CO7. Be able to understand the concepts of Dangerous Drugs Act, Pharmacy Act and Excise duties Act

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-
CO6	3	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-
CO7	3	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1 Pharmaceutical Legislations and ethics (12 Periods)
A brief review Principle and Significance of professional ethics. Critical study of the code of pharmaceutical ethics drafted by PCI.

Module 2 Drugs and Cosmetics Act, 1940, and rules 1945 (06Periods)
Objectives, Legal definition, Study of Schedule's with reference to Schedule B, C&C1, D, E1, F&F1, F2, F3, FF, G, H, J, K, M, N, P, R, V, W, X, Y. Sales, Import, labeling and packaging of Drugs and Cosmetics Provisions Relating to Indigenous Systems. Constitution and Functions of DTAB, DCC, CDL. Qualification and duties –Govt. analyst and Drugs Inspector

Module 3 Pharmacy Act –1948. **(06Periods)**
Objectives Legal Definitions, General Study, Constitution and Functions of State & Central Council, Registration & Procedure, Education Regulations.

Module 4 Medicinal and Toilet Preparation Act –1955. **(06Periods)**
Objectives, Legal Definitions, Licensing, Bonded and Non-Bonded Laboratory, Ware Housing, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations.

Module 5 Narcotic Drugs and Psychotropic substances Act-1985 and Rules. **(06Periods)**
Objectives, Legal Definitions, General Study, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and regulations, Schedules to the Act.

Module 6 Drugs and magic remedies act (06Periods)
Study of Salient Features of Drugs and magic remedies Act and its rules.

Module 7 Drugs price control order (06Periods)
Study of essential Commodities Act Relevant to drugs price control Order

Module 8 Prevention Of Cruelty to animals Act-1960. (06Periods)
Prevention Of Cruelty to animals Act-1960.

Module 9 Drug Price control Order & National Drug Policy (06Periods)

Drug Price control Order & National Drug Policy (Current). Patents & design Act-1970
Brief study of prescription and Non-prescription Products.

Total 60 periods

RESOURCES

REFERENCES:

1. Forensic Pharmacy by B. Suresh
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-byM.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.

VIDEO LECTURES:

1. https://youtu.be/OWH72T4wALU
2. https://youtu.be/OWH72T4wALU
3. https://youtu.be/SDA6CaVzeVY
4. https://youtu.be/Rj3S95mrzMw
5. https://youtu.be/LZQXKL07jVU

WEB RESOURCES:

1. https://www.iptsalipur.org/wp-content/uploads/2020/08/BP505T-PJ-UNIT_III.pdf
2. https://www.iptsalipur.org/wp-content/uploads/2020/08/BP505T-PJ-UNIT_IV.pdf
3. https://www.iptsalipur.org/wp-content/uploads/2020/08/BP505T-PJ-UNIT_V.pdf

Course Code	Course Title	L	T	P	C
23PA201013	MEDICINAL CHEMISTRY-III	3	1	-	4

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This subject is designed to impart fundamental knowledge on the structure, chemistry, and therapeutic value of drugs. The subject emphasis on modern techniques of frational drug design like quantitative structure activity relationship (QSAR), Prodrug concept, combinatorial chemistry and Computer aided drug design (CADD). The subject also emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses, and synthesis of important
drugs.

COURSE OUTCOMES: After successful completion of the course, students will be able to:
CO1. Understand the importance of drug design and different techniques of drug design.

CO2. Understand the chemistry of drugs concerning their biological activity.

CO3. Know the metabolism, adverse effects, and therapeutic value of drugs and Know the importance of SAR of drugs.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO2	2	2	-	2	-	-	-	-	-	-	-	-	2	-	-	-
CO3	2	-	-	2	-	-	-	-	-	-	-	-	2	-	-	-
Course Correlation Mapping	2	2	-	2	-	-	-	-	-	-	-	-	2	-	-	-

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: The modern concept of rational drug design *(16 Periods)*

A brief introduction to Quantitative Structure Activity Relationship (QSAR), prodrug, combinatorial chemistry and computer-aided drug design (CADD), and concept of antisense molecules. A study of the development of the following classes of drugs including SAR, mechanism of action, synthesis of important compounds, chemical nomenclature, brand names of important marketed products, and their side effects.

Module 2: Anti-infective agents *(15 Periods)*

1. Anti-infective agents

a) Local anti-infective agents

b) Preservatives

c) Antifungal agents

d) Urinary tract anti-infectives

e) Antitubercular agents

f) Antiviral agents and Anti-AIDS agents

g) Antiprotozoal agents

h) Anthelmintics

i) Antiscabies and Antipedicular agents

2. Sulphonamides and sulphones

Module 3: Antimicrobial agents *(10 Periods)*

4. Antimalarials

5. Antibiotics

6. Antineoplastic agents

Module 4: Drugs acting on CVS *(15 Periods)*

7. Cardiovascular agents
   a) Antihypertensive agents
   b) Antianginal agents and vasodilators
   c) Antiarrhythmic agents
   d) Antihyperlipidemic agents
   e) Coagulants and Anticoagulants
   f) Endocrine
8. Hypoglycemic agents
9. Thyroid and Antithyroid agents

Module 5: Diuretics *(15 Periods)*

10. Diuretics
11. Diagnostic agents
12. Steroidal Hormones and Adrenocorticoids

Total Periods: 75

RESOURCES

TEXTBOOKS:

1. "Textbook of Practical Organic Chemistry" by A.I. Vogel
2. "Wilson and Gisvold's Organic Medicinal and Pharmaceutical Chemistry"
3. "Foye's Principles of Medicinal Chemistry"
4. "Burger's Medicinal Chemistry" (Volumes I to IV)
5. "The Organic Chemistry of Drug Synthesis" by Lednicer (Volumes 1-5)
6. "Indian Pharmacopoeia"

VIDEO LECTURES:

1. https://youtu.be/L8ugeBkYhdw?si=ecqBKuDU7Ti2Rj1
2. https://youtu.be/QS9tNtUgCxU?si=xaOWVtjY_nwKzOMQ
3. https://youtu.be/dnudSGJAW7s?si=sThBRJepqu_CdFb-

WEB RESOURCES:

1. https://adph.org/ems/assets/StudentManual_AntiInfectives.pdf
2. https://content.sakai.rutgers.edu/access/content/user/kparis/biomaps_513_references/10_F_01_DrugDiscToday2_457_QSAR_QSAR3D.pdf
3. https://pharmacyconcepts.in/wp-content/uploads/2022/05/Sulfonamide-and-Sulfone.pdf

Course Code	Course Title	L	T	P	C
23PH201011	**PHARMACEUTICAL FORMULATIONS**	**3**	**1**	**-**	**4**

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: COURSE DESCRIPTION: This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms and novel drug delivery systems. Upon completion of this course the student should be able to Upon completion of the subject student shall be able to Know the principle involved in formulation of various pharmaceutical dosage forms, prepare various pharmaceutical formulation, perform evaluation of pharmaceutical dosage forms and understand appreciate the concept of bioavailability and bioequivalence, their role in clinical situations.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the basics of pharmaceutical dosage forms, Tablets and capsules

CO2. Design and analyze the liquid orals, parenteral dosage forms and ophthalmic preparations

CO3. Design and analyze semisolid dosage forms and suppositories

CO4. Design and analyze various controlled release dosage forms

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	1	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	1	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	1	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-
Course Correlation Mapping	**1**	**1**	**1**	-	-	-	-	-	-	-	-	-	**1**	**-**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1 Solid dosage forms (20 Periods)

Pharmaceutical dosage form: Concept and classification

a. Tablets: Formulation of different types of tablets, tablet excipients, granulation techniques quality control and evaluation of tablets. Tablet coating, Type of coating, quality control tests for coated tablet.
b. Capsules: Production and filling of hard gelatin capsules, Raw material for shell, finishing, quality control tests for capsules. Production and filling of soft gelatin capsules, quality control tests for soft gelatin capsules.

Module 2 Liquid dosage forms (15 Periods)

a. Liquid orals: Formulation and evaluation of suspensions, emulsions and solutions. Stability of these preparations
b. Parenterals: Introduction Containers used for Parenterals (including official tests) formulation of large and small volume Parenterals Sterilization

c. Ophthalmic preparations: Introduction and Classification, formulation, packging and storage

Module 3 Semi – Solid dosage forms (20 Periods)

a. Introduction and classification Factors affecting absorption and anatomy of skin Packaging storage and labeling, Ointments Types of Ointment Base Preparation of ointment, Jellies Types of jellies Formulation of jellies.

b. Suppositories, Method of preparation, Types and Packaging

Module 4 Novel drug delivery systems (20 Periods)

Definition and concept of Controlled and Novel Drug delivery systems with available examples, viz. parentral, transdermal, buccal, rectal, nasal, implants and ocular.

Total 75 Periods

RESOURCES

TEXTBOOKS:

1. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
2. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition.
3. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea & Febiger, Philadelphia, 5thedition, 2005.
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition.

REFERENCES:

1. "Indian Pharmacopoeia"
2. "British Pharmacopoeia"
3. "Pharmaceutical Dosage Forms and Drug Delivery Systems" by H.C. Ansel et al., Lippincott Williams and Wilkins, New Delhi
4. "Cooper and Gunn's Dispensing for Pharmaceutical Students" by Carter S.J., CBS Publishers, New Delhi
5. "Pharmaceutics: The Science and Dosage Form Design" by M.E. Aulton, Churchill Livingstone, Edinburgh
6. "Theory and Practice of Industrial Pharmacy" by Lachman, Lea & Febiger Publisher, The University of Michigan
7. "Remington: The Science and Practice of Pharmacy" by Alfonso R. Gennaro, Lippincott Williams, New Delhi
8. "Cooper and Gunn's Tutorial Pharmacy" by Carter S.J., CBS Publications, New Delhi

VIDEO LECTURES:

1. https://youtu.be/Ls6YEw0I7QY
2. https://youtu.be/d0RkchmUQLo
3. https://youtu.be/ICbT6SQr2mI
4. https://youtu.be/SCFc-VLutWY

WEB RESOURCES:

1. http://www.triphasepharmasolutions.com/Private/USP%201151%20PHARMACEUTICAL%20DOSAGE%20FORMS.pdf
2. http://repo.upertis.ac.id/1871/1/4_455253171732742643.pdf
3. https://oasis.iik.ac.id:9443/library/repository/f8a53a04219e4fbc6c8cf8a86fa85b6b.pdf

Course Code	Course Title	L	T	P	C
23PC205002	**PHARMACOLOGY-II (PRACTICAL)**	**-**	**-**	**4**	**2**

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION:

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the effect of drugs on experimental animals by simulated experiments.

CO2. Demonstrate the bioassays by simulated experiments.

CO3. Demonstrate the various receptor actions using isolated tissue preparation.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	-	-	1	2	-	-	-	1	-	-	-	3	-	3	-
CO2	3	-	-	1	2	-	-	-		-	-	-		-	3	
CO3	3	2	-	1	1		-	-	1	-	-	-	3		3	2
Course Correlation Mapping	**3**	**2**	-	**1**	**2**	-	-	-	**1**	-	-	**-**	**3**	-	**3**	**2**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

EXPERIMENTS

1. Study of laboratory animals and their handling (a. Frogs, b. Mice, c. Rats, d. Guinea pigs, e. Rabbits).
2. Study of physiological salt solutions used in experimental pharmacology.
3. Study of laboratory appliances used in experimental pharmacology.
4. Study of use of anesthetics in laboratory animals.
5. To record the dose response curve of Ach using isolated ileum/rectus abdominis muscle preparation
6. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by interpolation method.
7. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation bythree point method.
8. To record the dose response curve of Histamine using isolated guinea-pig ileum preparation.
9. Study of agonistic and antagonistic effects of drugs using isolated guinea-pig ileum preparation
10. To carry out bioassay of Histamine using isolated guinea-pig ileum preparation by interpolation method.
11. To carry out bioassay of Histamine using guinea-pig ileum preparation by three point method
12. To study the routes of administration of drugs in animals (Rats, Mice, Rabbits).
13. Study of theory, principle, procedure involved and interpretation of given results for the following experiments:
    a) Analgesic property of drug using analgesiometer.
    b) Anti-inflammatory effect of drugs using rat-paw edema method.
    c) Anticonvulsant activity of drugs using maximal electroshock and pentylenetetrazol methods.
    d) Antidepressant activity of drugs using pole climbing apparatus and pentobarbitone-induced sleeping time methods.
    e) Locomotor activity evaluation of drugs using an actophotometer and rotorod.
    f) Cardiotonic activity of drugs using isolated frog heart and mammalian heart preparations.

Course Code	Course Title	L	T	P	C
23PA205006	**PHARMACEUTICAL ANALYSIS**	**-**	**-**	**4**	**2**

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION:

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Practical skills for the analysis of drugs and excipients using various instrumentation

CO2. To make accurate analysis and report the results in defined formats.
& learn documentation and express the observations with clarity.
To understand the professional and safety responsibilities of working in the analysis laboratory.

CO3. Practical skills for the analysis of drugs and excipients using various instrumentation techniques.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-
CO2	3	2	-	-	-	-	-	-		-	-	-		-	-	-
CO3	3	2	-	-	-		-	-	-	-	-	-	-		-	-
Course Correlation Mapping	**3**	**2**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

EXPERIMENTS

14. Separation and identification of Amino Acids by Paper Chromatography.
15. Separation and identification of Sulpha drugs by TLC technique.
16. Effect of pH and solvent on the UV spectrum of given compound.
17. Comparison of the UV spectrum of a compound with that of its derivatives.
18. Determination of dissociation constant of indicators using UV-Visible spectroscopy.
19. Conductometric titration of mixture of acids with a strong base.
20. Potentiometric titration of a acid with a strong base.
21. Estimation of drugs by Fluorimetric technique.
22. Study of quenching effect in fluorimetry.
23. Colourimetric estimation of Supha drugs using BMR
24. Simultaneous estimation of two drugs present in given formulation.
25. Assay of Salicylic Acid by colourimetry.
26. Determination of Chlorides and Sulphates in Calcium gluconate by Nephelo turbidimetric Method.

14 Determination of Na/K by Flame Photometry

15 Determination of pKa using pH meter.

16 Determination of specific rotation.

17 Comparison of the IR spectrum of a compound with that of its derivatives.

18 Demonstration of HPLC.

19 Demonstration of HPTLC.

20 Demonstration of GC-MS.

21 Demonstration of DSC.

22 Interpretation of NMR spectra of any one compound.

Course Code	Course Title	L	T	P
23PP205002	**PHARMACOTHERAPEUTICS – II**	**-**	**-**	**3**
Pre-Requisite	-			
Anti-Requisite	-			
Co-Requisite	-			

COURSE DESCRIPTION: This course is designed to impart knowledge and skills in developing therapeutic plan and provide pharmaceutical care to the patients using SOAP notes.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1.	Demonstrate the treatment goals to the patient;
CO2.	Analyze patient outcome in selection, monitoring and initiation of drug therapies;
CO3.	Provide feedback to clinicians regarding drug related needs.
CO4.	Work independently and in teams to solve problems with effective communications

CO-PO Mapping Table:

Course Outcome	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PS O4
CO1	3	3	-	2	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3	3	-	2	2	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-	-
Course Correlation Mapping	3	3	-	2	2	-	-	-	3	3	-	-	-	2	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

LIST OF EXPERIMENTS:

Hospital postings for a period of at least 50 Periods is required to understand the principles and practice involved in ward round participation and clinical discussion on selection of drug therapy. Students are required to maintain a record of 15 cases observed in the ward and the same should be submitted at the end of the course for evaluation. Each student should present at least two medical cases they have observed and followed in the wards Assessment of drug interactions in the given prescriptions

Assignments:
Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases.
A minimum of THREE assignments [1500–2000words] should be submitted for evaluation.
Format of the assignment:
Minimum & Maximum number of pages
Reference(s) shall be included at the end.
Assignment can be a combined presentation at the end of the academic year
It shall be computer draft copy
Name and signature of the student
Time allocated for presentation may be 8+2 Min.

RESOURCES

TEXTBOOKS:

1. Schwinghammer, T.L., Koehler, J.M., & Borcher, J.S. (2020). Pharmacotherapy Casebook: A Patient-Focused Approach (11th Edition). McGraw Hill / Medical.
2. https://mis.kp.ac.rw/admin/admin_panel/kp_lms/files/digital/Core%20Books/Nursing/Drugs%20in%20Use,%204th%20ed%20[Dodds,%20Linda].pdf.pdf

VIDEO LECTURES:

1. https://www.hopkinsarthritis.org/arthritis-info/rheumatoid-arthritis/ra-treatment/
2. https://www.medcram.com/courses/acute-renal-failure-explained-clearly
3. https://www.youtube.com/watch?v=tQ1FkG1Si3w
4. https://www.youtube.com/watch?v=FSHCe_suaK0

WEB RESOURCES:

1. https://www.bpsweb.org/pharmacotherapy-sample-questions/
2. https://www.meddean.luc.edu/lumen/meded/mech/cases/case24/caseqa_f.htm
3. https://www.immunopaedia.org.za/clinical-cases/infectious-diseases/
4. https://vts.wm.hee.nhs.uk/Portals/5/Presentations/Full%20Day/Case%20Studies%20from%20dermatology%20workshop.pdf

Course Code	Course Title	L	T	P	C
23PA205007	**MEDICINAL CHEMISTRY**	**-**	**-**	**4**	**2**

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION:

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO4. Understand practical skills for the analysis of drugs and excipients using various instrumentation techniques.

CO5. make accurate analysis and report the results in defined formats & learn documentation and express the observations with clarity.

CO6. understand the professional and safety responsibilities of working in the analysis laboratory.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-
CO2	3	2	-	-	-	-	-	-		-	-	-		-	-	-
CO3	3	2	-	-	-		-	-	-	-	-	-	-		-	-
Course Correlation Mapping	**3**	**2**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

EXPERIMENTS

1. Assays of important drugs from the course content.
2. Preparation of medicinally important compounds or intermediates required for the synthesis of drugs.
3. Monograph analysis of important drugs.
4. Determination of partition coefficients, dissociation constants, and molar refractivity of compounds for QSAR analysis.

Course Code	Course Title	L	T	P	C
23PH205005	**PHARMACEUTICAL FORMULATION PRACTICAL**	**-**	**-**	**3**	**3**

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course is designed to impart knowledge on the preparatory pharmacy with arts and science of preparing the various conventional dosage forms, parenterals and cosmetic preparations. Upon completion of this course the student should be able to Understand the basics of various conventional dosage forms, parenteral and cosmetic preparations.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the preparations and evaluations of solid dosage forms.
CO2. Demonstrate the preparations and evaluations of Parenteral preparations.
CO3. Demonstrate the preparations and evaluations of liquid orals.
CO4. Demonstrate the preparations and evaluations of semi solid dosage forms.
CO5. Demonstrate the preparations and evaluations of cosmetic preparations.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-	-
CO2	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-	-
CO3	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-	-
CO4	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-	-
CO5	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-	-
Course Correlation Mapping	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-	-

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

1.	Manufacture of Ordinary compressed tablet by wet granulation method
2.	Manufacture of Tablets by direct compression.
3.	Manufacture of Soluble tablet.
4.	Manufacture of Chewable tablet.
5.	Formulation and filling of hard gelatin capsules.
6.	Evaluation of Evaluation of Tablets.
7.	Evaluation of Evaluation of Capsules.
8.	Demonstration of Tablet coating.
9.	Manufacture of Ascorbic acid injection.
10.	Manufacture of Calcium gluconate injection
11.	Manufacture of Sodium chloride infusion
12.	Manufacture of Dextrose and Sodium chloride injection/ infusion.
13.	Evaluation of injections
14.	Formulation and evaluation of Paracetamol Syrup.
15.	Formulation and evaluation of Aluminium hydroxide gel.
16.	Formulation and evaluation of Salicyclic acid and benzoic acid ointment.
17.	Formulation and evaluation of Diclofenac gel.
18.	Formulation and evaluation of Lipsticks.
19.	Formulation and evaluation of cold cream and vanishing cream.
20.	Formulation and evaluation of clear liquid shampoo.
21.	Formulation and evaluation of Toothpaste and Tooth powder.

IV YEAR

Course Code	Course Title	L	T	P
23PP201005	**PHARMACOTHERAPEUTICS – III**	**3**	**1**	**-**

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course is designed to impart knowledge and skills necessary for imparting safe and effective use of medicines in patients. They also learn pharmacotherapy of diseases with etiopathogenesis, diagnostic criteria and drug therapy management practices. This also helps to understand and practice evidence-based medicine during disease management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO Assess and manage gastrointestinal disorders, including peptic ulcer disease, GERD, inflammatory bowel disease, liver disorders, and drug-induced liver damage.

CO2. Identify and treat hematological conditions such as anemias, venous thromboembolism, and drug-induced blood disorders effectively.

CO3. Diagnose and develop treatment plans for neurological disorders, including epilepsy, Parkinsonism, stroke, and Alzheimer's disease.

CO4. Implement pain management strategies, addressing pain pathways, neuralgias, and various types of headaches to improve patient outcomes.

CO5. Diagnose and manage psychiatric disorders, including schizophrenia, affective disorders, anxiety, sleep disorders, obsessive-compulsive disorders, and alcohol withdrawal syndrome.

CO6. Apply evidence-based medicine principles to evaluate and integrate the best available research evidence into clinical practice.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	2	-	-	-	-	-	2	-	-
CO2	3	2	-	-	-	-	-	2	-	-	-	-	-	2	-	-
CO3	3	2	-	-	-	-	-	2	-	-	-	-	-	2	-	-
CO4	3	2	-	-	-	-	-	2	-	-	-	-	-	2	-	-
CO5	2	2	-	-	-	-	-	2	-	-	-	-	-	2	-	-
CO6	2	3	3	-	-	-	-	2	-	2	-	2	-	2	-	-
Course	2.7	2.1	3	-	-	-	-	2	-	2	-	2	-	2	-	-

Correlation Mapping																

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: GASTROINTESTINAL SYSTEM ***(16 Periods)***

Peptic ulcer disease, Gastro Esophageal Reflux Disease, Inflammatory bowel disease, Liver disorders - Alcoholic liver disease, Viral hepatitis including jaundice, Pancreatitis and Drug induced liver disorders.

Module 2: HEMATOLOGICAL SYSTEM ***(11 Periods)***

Anemias, Venous thromboembolism, Drug induced blood disorders.

Module 3: NERVOUS SYSTEM ***(15 Periods)***

Epilepsy, Parkinsonism, Stroke, Alzheimer's disease,

Module 4: PAIN MANAGEMENT ***(10 Periods)***

Pain management including Pain pathways, neuralgias, headaches.

Module 5: PSYCHIATRY DISORDERS ***(18 Periods)***

Schizophrenia, Affective disorders, anxiety disorders, sleep disorders, obsessive compulsive disorders, Alcohol withdrawal syndrome

Module 6: EVIDENCE BASED MEDICINE ***(05 Periods)***

Evidence Based Medicine

Total Periods: 75

RESOURCES

REFERENCES:

1. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange
2. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda -Kimble MA
3. Harrison's Principles of Internal Medicine, Twentieth Edition (Vol.1 & Vol.2) 20th Edition: - Volume I & Volume II

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=xogP0x97XUs
2. https://www.youtube.com/watch?v=Qku6kzDShhU
3. https://www.youtube.com/watch?v=hdTSx2KlYoA
4. https://www.youtube.com/watch?v=B1aoN5X8Hdw

WEB RESOURCES:

1. https://nhsrcindia.org/sites/default/files/2022-08/MNS%20Care%20for%20MO-%20Neurological%20Disorders.pdf
2. https://sitn.hms.harvard.edu/wp-content/uploads/2015/04/Psych_DayCon_060315.2.pdf
3. https://geekymedics.com/tag/psychiatry/
4. http://www.jiwaji.edu/pdf/ecourse/pharmaceutical/HAEMATOLOGICAL%20DISEASES,%20ANAEMIA.pdf

Course Code	Course Title	L	T	P
23PP201006	**HOSPITAL PHARMACY**	**2**	**1**	**-**

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on art, practice, and profession of choosing, preparing, storing, compounding, and dispensing medicines and medical devices, advising healthcare professionals and patients on their safe, effective and efficient use.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Manage hospital pharmacy operations, including organizational structure, staff, infrastructure, material management, and financial oversight, ensuring efficient pharmacy services.

CO2. Develop and implement hospital drug policies, including formulary management, committee involvement, therapeutic guidelines, and pharmacy communication strategies.

CO3. Oversee drug distribution methods, including individual prescriptions, floor stock, and module dose distribution, as well as manage central sterile supply services.

CO4. Handle hospital pharmacy services, including budget preparation, drug procurement, warehousing, and inventory control using methods like ABC, VED, and EOQ.

CO5. Manufacture various pharmaceutical products in a hospital setting, including sterile formulations, ointments, tablets, capsules, and total parenteral nutrition, ensuring quality and safety.

CO6. Engage in professional development and training, maintaining and enhancing skills, and fostering professional relationships within hospital pharmacy practice.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	2	-	-	-	-	-	-	-	2
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	2
CO5	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO6	2	-	-	-	-	-	-	-	2	3	-	3	-	-	-	-
Course Correlation Mapping	2.3	2	-	-	-	-	-	2	2	3	2	3	-	-	-	2

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: HOSPITAL PHARMACY ***(10 Periods)***

Hospital - its organization and functions

Hospital Pharmacy-Organization and management

a) Organizational Structure-Staff, Infrastructure & work load statistics
b) Management of materials and finance
c) Roles & responsibilities of hospital pharmacist.

Module 2: HOSPITAL DRUG POLICY ***(10 Periods)***

a) Pharmacy and Therapeutic committee (PTC)
b) Hospital formulary
c) Hospital committees - Infection committee - Research and ethical committee
d) Developing therapeutic guidelines
e) Hospital pharmacy communication - Newsletter

Module 3: DRUG DISTRIBUTION AND CENTRAL STERILE SUPPLY SERVICES ***(10 Periods)***

a) Drug distribution in the hospital
    i. Individual prescription method,
    ii. Floor stock method,
    iii. Module dose drug distribution method
b) Distribution of Narcotic and other controlled substances
c) Central sterile supply services – Role of pharmacist

Module 4: HOSPITAL PHARMACY SERVICES ***(10 Periods)***

a) The Budget – Preparation and implementation
b) Procurement & warehousing of drugs and pharmaceuticals
c) Inventory control Definition, various methods of Inventory Control ABC, VED, EOQ, Lead time, safety stock

Module 5: MANUFACTURING IN HOSPITAL PHARMACY ***(14 Periods)***

a) Sterile formulations – large and small volume Parenterals.
b) Manufacture of Ointments, Liquids, and creams.
c) Manufacturing of Tablets, granules, capsules, and powders.
d) Total parenteral nutrition.
e) Radio Pharmaceuticals – Handling and packaging.

Module 6: PROFESSIONAL DEVELOPMENT& RELATIONS ***(06 Periods)***

Continuing professional development programs Education and training.
Professional Relations and practices of hospital pharmacist.

Total Periods: 60

RESOURCES

REFERENCES:

1. William E. Hassan, JR. "Hospital Pharmacy" Fifth Edition. Lea and Febiger, Philadelphia.2003.
2. A text book of Hospital Pharmacy by S.H.Merchant & Dr. J.S. Qadry. Revised by R.K.Goyal & R.K. Parikh.
3. R.P.S. Vol.2. Part –B; Pharmacy Practice section.
4. Martin Stephens, Hospital Pharmacy, Second Edition, Pharmaceutical press, 2011.

VIDEO LECTURES:

4. https://www.youtube.com/watch?v=5s3vFzEyHY4
5. https://www.youtube.com/watch?v=mjyRUMY12cA
6. https://www.youtube.com/watch?v=63_70Eed0Q8
7. https://www.youtube.com/watch?v=o2dqaJ8aSgA
8. https://www.youtube.com/watch?v=jDl7ZGVe5mU
9. https://www.youtube.com/watch?v=spdtTCE599I

WEB RESOURCES:

4. https://noteskarts.com/wp-content/uploads/2023/03/Chapter-4-Hospital-and-Hospital-Pharmacy-Drug-distribution-complete-PDF-notes.pdf
5. https://noteskarts.com/wp-content/uploads/2022/11/Chapter-3-U-1-Hospital-pharmacy.pdf
6. https://archivepp.com/storage/models/article/DFlZVT7I7vmWU2Y75qnA4XrlyYFAk2OU52ddmMmkZ7ToOF8MorE080ZVJrxx/inventory-management-in-pharmacy-practice-a-review-of-literature.pdf
7. https://www.uv.mx/personal/izcamacho/files/2012/02/Pharmaceutical-Manufacturing-Handbook-Production-and-Processes-Wiley-2008.pdf
8. https://pharmacyce.unm.edu/nuclear_program/neolibrary/libraryfiles/basicsofradiopharmacy.pdf

Course Code	Course Title	L	T	P
23PP201007	**CLINICAL PHARMACY**	**3**	1	-

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on History and evolution of clinical pharmacy, clinical pharmacy activities, interpretation of laboratory tests, drug information, pharmaceutical care and medication errors.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Define and apply clinical pharmacy concepts, including drug therapy monitoring, ward round participation, adverse drug reaction management, and quality assurance of pharmacy services.

CO2. Analyze patient data effectively, including case history structure and medical abbreviations, to evaluate and optimize drug therapy in clinical settings.

CO3. Deliver clinical pharmacy services by implementing pharmaceutical care concepts, managing medication errors, enhancing patient communication, and critically evaluating biomedical literature.

CO4. Interpret laboratory data for disease evaluation, including tests related to hematology, liver, renal, thyroid functions, cardiac disorders, fluid balance, and microbiological cultures.

CO5. Utilize drug and poison information resources, systematically address drug information queries, evaluate literature, and establish and manage a Drug Information Centre.

CO6. Understand and apply pharmacovigilance principles, including ADR classification, causality assessment, reporting, monitoring, and management, and the pharmacist's role in ADR management.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	3	-	-	-	-	-	-	-	2	-	-	-	-	-	2
CO3	3	2	3	-	-	-	-	-	-	2	-	-	-	-	-	2
CO4	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO5	-	2	-	-	3	-	-	2	-	-	-	-	-	-	-	2
CO6	-	2	-	-	2	-	-	2	-	-	-	-	-	-	-	2
Course Correlation Mapping	3	2.3	2.5	-	2.5	-	-	2	-	2	-	-	-	-	-	2

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: EVOLUTION OF CLINICAL PHARMACY ***(15 Periods)***

1. Definitions, development and scope of clinical pharmacy.
2. Introduction to daily activities of a clinical pharmacist

a) Drug therapy monitoring (medication chart review, clinical review, pharmacist interventions)
b) Ward round participation
c) Adverse drug reaction management
d) Drug information and poisons information
e) Medication history
f) Patient counseling
g) Drug utilization evaluation (DUE) and review (DUR)
h) Quality assurance of clinical pharmacy services.

Module 2: PATIENT DATA ANALYSIS ***(10 Periods)***

a) The patient's case history, its structure and use in evaluation of drug therapy.
b) Understanding common medical abbreviations and terminologies used in clinical practices.

Module 3: CLINICAL PHARMACY SERVICES ***(12 Periods)***

a) Pharmaceutical care concepts
b) Medication errors
c) Patient communication - Communication skills, including patient counselling techniques, medication history interview, presentation of cases
d) Critical evaluation of biomedical literature

Module 4: INTERPRETATION OF LABORATORY DATA ***(14 Periods)***

Clinical laboratory tests used in the evaluation of disease states, and interpretation of test results

a) Haematological, Liver function, Renal function and thyroid function tests.
b) Tests associated with cardiac disorders.
c) Fluid and electrolyte balance.
d) Microbiological culture sensitivity tests.
e) Pulmonary Function Tests.

Module 5: DRUG & POISON INFORMATION ***(13 Periods)***

a) Introduction to drug information resources available.
b) Systematic approach in answering DI queries.
c) Critical evaluation of drug information and literature.
d) Preparation of written and verbal reports.
e) Establishing a Drug Information Centre.
f) Poisons information- organization & information resources.

Module 6: PHARMACOVIGILANCE ***(11 Periods)***

a) Scope, definition and aims of pharmacovigilance.
b) Adverse drug reactions - Classification, mechanism and predisposing factors.

c) Causality assessment [different scales used], Reporting, evaluation, monitoring, preventing & management of ADRs.

d) Role of pharmacist in management of ADR.

Total Periods: 75

RESOURCES

TEXT BOOKS:

1. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.
2. Rhonda M Jones Patient assessment in Pharmacy Practice, Lippincott Williams & Wilkins, 3rd edition, 2016.
3. Susan M Stein Boh's Pharmacy Practice Manual: A Guide to the Clinical Experience, Wolters Kluvers, 4e,2013.
4. Sherif Hanafy Mahmoud Patient Assessment in Clinical Pharmacy: A Comprehensive Guide, Sringer, 2019.

REFERENCE BOOKS:

1. Robert Cipolle, Linda Strand, Peter Morley, Pharmaceutical Care Practice: The Clinician's Guide McGraw-Hill Education / Medical; 2nd edition, 2004.
2. John Talbot and Jef F Rey K. Aronson, Stephens' Detection and Evaluation of Adverse Drug Reactions Principles and Practice. Sixth Edition, A John Wiley & Sons, Ltd., Publication, 2012.
3. Jeff Huges, Clinical Pharmacy a Practical Approach, The society of Hospital Pharmacists of Austaralia,2001.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=JSGDHJbN8xs
2. https://www.youtube.com/watch?v=w99qnRj_ZkY
3. https://www.youtube.com/watch?v=1LKA7EpfruE
4. https://www.youtube.com/watch?v=Na7NAk-9tu0

WEB RESOURCES:

1. http://file.cop.ufl.edu/pop/hepler/apha/PhC_Principles_and_Processes.pdf
2. https://www.pharmacy.gov.my/v2/sites/default/files/document-upload/drug-poison-info-svcs.pdf
3. https://courseware.cutm.ac.in/wp-content/uploads/2022/12/Daily-activities-of-clinical-pharmacists-PDF.pdf
4. https://www.pastest.com/media/2159/look-inside-pages-data-interps-3e-lo-res.pdf

Course Code	Course Title	L	T	P
23PY201005	**BIOSTATISTICS AND RESEARCH METHODOLOGY**	**2**	**1**	**-**

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on basic concepts of research and its methodologies, define appropriate research problem and parameters, organize and conduct research in a more appropriate manner.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Design and evaluate clinical studies using various methodologies, including case studies, observational studies, interventional studies, and determine sample size and report findings effectively.

CO2. Apply biostatistical methods to describe data distributions, central tendencies, and data spread using average, median, mode, standard deviation, and variance.

CO3. Create and interpret data graphics, including histograms, pie charts, scatter plots, and semilogarithmic plots, for effective visual representation of data.

CO4. Perform hypothesis testing using parametric and non-parametric methods, including t-tests, chi-square tests, ANOVA, and regression analysis, and utilize statistical software.

CO 5 Utilize statistical methods in epidemiology to measure incidence, prevalence, relative risk, and attributable risk, aiding in the assessment of health outcomes.

CO 6 Apply computer applications in pharmacy for hospital and community settings, including patient record management, medication order entry, inventory control, and drug information retrieval.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	-	2	-	-	2	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	-	-	2	-	-	-	-	-	3	-	-	-	2	-
CO4	-	-	-	-	-		-	-	-	-	2	-	-	-	2	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
Course Correlation Mapping	2.5	2	2	-	2	-	-	-	-	-	2.5	-	-	-	2	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT:

Module 1: RESEARCH METHODOLOGY ***(10 Periods)***

a) Types of clinical study designs: Case studies, observational studies, interventional studies,
b) Designing the methodology
c) Sample size determination and Power of a study, Determination of sample size for simple comparative experiments, determination of sample size to obtain a confidence interval of specified width, power of a study
d) Report writing and presentation of data

Module 2: BIOSTATISTICS ***(10 Periods)***

a) Introduction
b) Types of data distribution
c) Measures describing the central tendency distributions- average, median, mode
d) Measurement of the spread of data-range, variation of mean, standard deviation, variance, coefficient of variation, standard error of mean.

Module 3: DATA GRAPHICS ***(08 Periods)***

a) Construction and labelling of graphs.
b) Histogram, pie charts, scatter plots, semilogarithmic plots.

Module 4: BASICS OF TESTING HYPOTHESIS ***(12 Periods)***

a) Null hypothesis, level of significance, power of test, P value, statistical estimation of confidence intervals.
b) Level of significance (Parametric data)- students t test (paired and unpaired), chi Square test, Analysis of Variance (one-way and two-way).
c) Level of significance (Non-parametric data)- Sign test, Wilcoxan's signed rank test, Wilcoxan rank sum test, Mann Whitney U test, Kruskal-Wall is test (one way ANOVA).
d) Linear regression and correlation- Introduction, Pearsonn's and Spearmann's correlation and correlation co-efficient.
e) Introduction to statistical software: SPSS, Epi Info, SAS.

Module 5: STATISTICAL METHODS IN EPIDEMIOLOGY ***(07 Periods)***

a) Incidence and prevalence.
b) Relative risk.
c) Attributable risk.

Module 6: COMPUTER APPLICATIONS IN PHARMACY ***(13 Periods)***

a) Computer System in Hospital Pharmacy: Patterns of Computer use in Hospital Pharmacy – Patient record database management, Medication order entry – Drug labels and list – Intravenous solution and admixture, patient medication profiles, Inventory control, Management report & Statistics.
b) Computer In Community model Pharmacy - Computerizing the Prescription Dispensing process, Use of Computers for Pharmaceutical Care in community model pharmacy, Accounting and General ledger system.
c) Drug Information Retrieval & Storage: Introduction – Advantages of Computerized Literature Retrieval, Use of Computerized Retrieval

Total Periods: 60

RESOURCES

REFERENCE BOOKS:

2. Pharmaceutical statistics- practical and clinical applications, Sanford Bolton 3rd edition, publisher Marcel Dekker Inc. NewYork.
3. Drug Information- A Guide for Pharmacists, Patrick M Malone, Karen L Kier, John E Stanovich, 3rd edition, McGraw Hill Publications 2006

VIDEO LECTURES:

4. https://youtu.be/ckltFkPu6co
5. https://youtu.be/6LgVrfEQWE8
6. https://youtu.be/JDtXkqYQNtM

WEB RESOURCES:

4. https://www.researchgate.net/publication/319207471_HANDBOOK_OF_RESEARCH_METHODOLOGY
5. https://www.cabi.org/VetMedResource/ebook/20123404818
6. https://www.researchgate.net/publication/322520049_Computer_Applications_in_Pharmacy

Course Code	Course Title	L	T	P
23PH201012	**BIOPHARMACEUTICS AND PHARMACOKINETICS**	**3**	**1**	**-**

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides various skills to carry out, design and apply the concepts like compartmental modeling, noncompartmental modeling, and other methods to study the processes of drug absorption, drug distribution, drug metabolism, drug elimination.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze drug absorption, distribution, and elimination processes to understand their effects on drug efficacy and safety in biopharmaceutics.

CO2. Apply pharmacokinetic principles, including mathematical models and compartmental analysis, to study drug levels and optimize dosing regimens.

CO3. Utilize one-compartment and multi-compartment models to understand and predict drug behavior following intravenous and oral administration.

CO4. Evaluate and apply multiple-dose regimens using one-compartment and two-compartment models for effective drug therapy and management.

CO5. Implement noncompartmental and nonlinear pharmacokinetic methods to assess drug behavior and parameters, including statistical moment theory and Michaelis-Menten kinetics.

CO6. Conduct bioavailability and bioequivalence studies, including protocol design and assessment methods, to ensure drug products meet required standards.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	3	3	-	-	-	-	-	-	-	2	-	-	-
CO2	3	-	-	3	2	-	-	-	-	-	2	-	2	-	-	-
CO3	-	3	-	2	2	-	-	-	-	-	-	-	2	-	-	-
CO4	-	3	-	2	2	-	-	-	-	-	-	-	-	-	-	-
CO5	-	1	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO6	-	2	-	3	3	-	-	-	-	-	-	2	2	-	-	-
Course Correlation Mapping	2.5	2.3	-	2.7	2.3	-	-	-	-	-	2	2	2	-	-	-

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: BIOPHARMACEUTICS ***(12 Periods)***

a) Introduction to Biopharmaceutics.
b) Absorption of drugs from gastrointestinal tract.
c) Drug Distribution.
d) Drug Elimination.

Module 2: PHARMACOKINETICS ***(13 Periods)***

Introduction to Pharmacokinetics.

a) Mathematical model
b) Drug levels in blood.
c) Pharmacokinetic model.
d) Compartment models.
e) Pharmacokinetic study.

Module 3: COMPARTMENTAL MODELING ***(16 Periods)***

a) One compartment open model - Intravenous Injection (Bolus) and Intravenous infusion.
b) Multicompartment model - Two compartment open model IV bolus, IV infusion and oral administration.

Module 4: MULTIPLE – DOSAGE REGIMENS ***(08 Periods)***

a) Repetitive Intravenous injections – One Compartment Open Model.
b) Repetitive Extravascular dosing – One Compartment Open model.
c) Multiple Dose Regimen – Two Compartment Open Model.

Module 5: NONCOMPARTMENTAL AND NONLINEAR PHARMACOKINETICS ***(16 Periods)***

Noncompartmental pharmacokinetics

a) Statistical Moment Theory.
b) MRT for various compartment models.
c) Physiological Pharmacokinetic model.

Nonlinear pharmacokinetics

a) Introduction.
b) Factors causing Non-linearity.
c) Michaelis-menton method of estimating parameters.

Module 6: BIOAVAILABILITY AND BIOEQUIVALENCE ***(10 Periods)***

a) Introduction.
b) Bioavailability study protocol.
c) Methods of Assessment of Bioavailability.

Total Periods: 75

RESOURCES

TEXT BOOKS:

1. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
2. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B. Jaiswal, Vallabh Prakashan Pitampura, Delhi
3. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Robert F Notari Marcel Dekker Inn, New York and Basel, 1987.

REFERENCE BOOKS:

1. Encyclopaedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James, C. Roylan, Marcel Dekker Inc, New York 1996.
2. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
3. Cilincal Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.

VIDEO LECTURES:

1. https://youtu.be/WuFy5r7B1pQ
2. https://youtu.be/x3dYISmnk5U
3. https://youtu.be/3S20pnv28ys

WEB RESOURCES:

1. https://books.google.com/books/about/Biopharmaceutics_and_Pharmacokinetics.html?id=LLpLxAEACAAJ
2. https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/absorption-distribution-metabolism-excretion-study
3. https://www.sciencedirect.com/topics/engineering/pharmacokinetic-model#:~:text=A%20pharmacokinetic%20model%20describes%20the, have%20three%20or%20fewer% 20compartments.

Course Code	Course Title	L	T	p
23PP201008	**CLINICALTOXICOLOGY**	**2**	**1**	**-**

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides knowledge in the area of clinical management of different poison cases and facilitates students to learn in direct toxicological care area including Identification of toxins, pathological changes upon exposure, management practices of poison cases and preventive approaches for the public.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1.	Apply general principles of poison management, including antidote use, supportive care, gut decontamination, and toxicokinetics for effective treatment.
CO2.	Identify venomous snake species, understand their clinical effects, and manage snake bites, including first aid and treatment of complications.
CO3.	Recognize and manage acute poisoning cases, including pesticides, opiates, alcohol, and caustics, with appropriate clinical interventions.
CO4.	Diagnose and treat chronic poisoning from heavy metals such as arsenic, lead, mercury, iron, and copper.
CO5.	Address poisoning from plants, mushrooms, and food, and manage envenomations from arthropod bites and stings.
CO6.	Identify and treat substance abuse, including signs, symptoms, and management of dependence on CNS stimulants, depressants, hallucinogens, and tobacco.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	-	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	2	-	-	-	3	-	-	-	2	-	-
CO4	-	-	-	-	-	2	-	-	-	3	-	-	-	2	-	-
CO5	-	-	-	-	-	3	-	-	-	-	-	-	-	2	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Course Correlation Mapping	2.5	2	-	-	-	2.3	-	-	-	3	-	-	-	2	-	-

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: PRINCIPLES OF POISON MANAGEMENT ***(13 Periods)***

a) General principles involved in the management of poisoning.
b) Antidotes and the clinical applications.
c) Supportive care in clinical Toxicology.
d) Gut Decontamination and Elimination Enhancement.
e) Toxicokinetics.

Module 2: VENOMOUS SNAKE BITES ***(07 Periods)***

a) Families of venomous snakes.
b) Clinical effects of venoms.
c) General management as first aid, early manifestations, complications and snake bite injuries.

Module 3: ACUTE POISONING ***(14 Periods***

Clinical symptoms and management of acute poisoning with the following agents–

a) Pesticide poisoning: organophosphorus compounds, carbamates, organochlorines, pyrethroids.
b) Opiates overdose, Antidepressants, Barbiturates and benzodiazepines.
c) Alcohol: ethanol and methanol.
d) Paracetamol and salicylates, Non-steroidal anti-inflammatory drugs.
e) Hydrocarbons: Petroleum products and PEG.
f) Caustics: inorganic acids and alkali, Radiation poisoning.

Module 4: CHRONIC POISONING ***(06 Periods)***

Clinical symptoms and management of chronic poisoning with the Heavy metals-

a) Arsenic
b) Lead
c) Mercury
d) Iron
e) Copper.

Module 5: PLANT, FOOD &ENVENOMATIONS ***(08 Periods)***

a) Plants poisoning.
b) Mushrooms and Mycotoxins.
c) Food poisonings.
d) Envenomations – Arthropod bites and stings.

Module 6: SUBSTANCE ABUSE ***(12 Periods)***

a) Signs and symptoms of substance abuse and treatment of dependence.
b) CNS stimulants: amphetamine, Opioids, CNS depressants, Hallucinogens: LSD, Cannabis group, Tobacco.

Total Periods: 60

RESOURCES

TEXT BOOKS:

1. Text book Of Forensic Medicine & Toxicology by Nagesh kumar G Rao , Jaypee Brothers Medical Pub (P) Ltd
2. V V Pillay. Handbook of Forensic Medicine and Toxicology. Thirteenth edition 2003 Paras Publication, Hyderabad
3. Textbook of Forensic Medicine and Toxicology by M. Manivasagam (CBSPD Edition)
4. Medical Toxicology Review: Pearls of Wisdom, Second Edition

REFERENCE BOOKS:

1. Matthew J Ellenhorn. Ellenhorns Medical Toxicology – Diagnosis and Treatment of Poisoning. Second edition. Williams and Willkins publication, London.
2. V V Pillay. Handbook of forensic medicine and toxicology. Thirteenth edition 2003 paras publication, hyderabad

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=e34HPJ21Z2k
2. https://www.youtube.com/watch?v=OwADgtJOF_M
3. https://www.youtube.com/watch?v=IlOJ-gk7aQ8
4. https://www.youtube.com/watch?v=P4F-G9ml9mo

WEB RESOURCES:

1. https://annamalaiuniversity.ac.in/studport/download/engg/pharm/resources/pharmd_4Y%20&%201Y%20(PB)_4.6_clinical%20toxicology.pdf
2. https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/med_lab_tech_students/ln_toxicology_final.pdf

Course Code	Course Title	L	T	P
23PP205003	**PHARMACOTHERAPEUTICS – III Practical**	**-**	**-**	**3**

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course is designed to impart knowledge and skills in developing therapeutic plan and provide pharmaceutical care to the patients using SOAP notes.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO5. Demonstrate the treatment goals to the patient;
CO6. Analyze patient outcome in selection, monitoring and initiation of drug therapies;
CO7. Provide feedback to clinicians regarding drug related needs.
CO8. Work independently and in teams to solve problems with effective communications

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	2	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3	3	-	2	2	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-	-
Course Correlation Mapping	**3**	**3**	**-**	**2**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

LIST OF EXPERIMENTS:

Hospital postings for a period of at least 50 Periods is required to understand the principles and practice involved in ward round participation and clinical discussion on selection of drug therapy. Students are required to maintain a record of 15 cases observed in the ward and the same should be submitted at the end of the course for evaluation. Each student should present at least two medical cases they have observed and followed in the wards Assessment of drug interactions in the given prescriptions

ASSIGNMENTS:

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases.
A minimum of THREE assignments [1500–2000words] should be submitted for evaluation.
Format of the assignment:

i. Minimum & Maximum number of pages
ii. Reference(s) shall be included at the end.
iii. Assignment can be a combined presentation at the end of the academic year
iv. It shall be computer draft copy
v. Name and signature of the student
vi. Time allocated for presentation may be 8+2 Min.

RESOURCES

TEXT BOOKS:

3. Pharmacotherapy Casebook: A Patient-Focused Approach, 11th Edition, Terry L. Schwinghammer, Julia M. Koehler, Jill S. Borcher, McGraw Hill / Medical,2020
4. Practical Psychopharmacology: Translating Findings From Evidence-Based Trials into Real-World Clinical Practice, by Joseph F. Goldberg, Stephen M. Stahl, Alan F. Schatzberg, Cambridge University Press; New edition (29 April 2021).

VIDEO LECTURES:

5. https://www.hopkinsarthritis.org/arthritis-info/rheumatoid-arthritis/ra-treatment/
6. https://www.medscape.com/viewarticle/987261
7. https://psychopharmacologyinstitute.com/publication/pharmacotherapy-of-treatment-resistant-ocd-augmentation-strategies-2191
8. https://www.sydney.edu.au/medicine-health/our-research/research-centres/pain-management-research-institute.html

WEB RESOURCES:

5. https://www.bpsweb.org/pharmacotherapy-sample-questions/
6. https://www.physio-pedia.com/Parkinson%27s_Disease:_A_Case_Study
7. https://www.physio-pedia.com/Panic_Disorder
8. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3002647/

Course Code	Course Title	L	T	P
23PP205004	**HOSPITAL PHARMACY PRACTICAL**	**-**	**-**	**3**

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides hands-on experience on providing drug information, assessing drug interactions in prescriptions, control on inventory and manufacturing various pharmaceuticals required for patients in hospital.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Evaluate Drug interactions in prescriptions

CO2. Provide Unbiased information to health care professionals and patients

CO3. Perform various manufacturing practices in hospital

CO4. Appreciate the Stores Management and Inventory Control.

CO5. Work independently and in teams to solve problems with effective communications

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	2	2	-	-	-	-	-	-	-	-	-	-	2
CO2	3	3	-	2	2	-	-	-	-	3	-	-	-	-	-	2
CO3	3	3	-	-	2	-	-	-	-	-	-	-	-	-	-	2
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO5	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-	-
Course Correlation Mapping	**3**	**3**	**-**	**2**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**2**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

LIST OF EXPERIMENTS:

1. Assessment of drug interactions in the given prescriptions
2. Manufacture of parenteral formulations, powders.
3. Drug information queries.
4. Inventory control

LIST OF ASSIGNMENTS:

1. Design and Management of Hospital pharmacy department for a 300 bedded hospital.
2. Pharmacy and Therapeutics committee–Organization, functions, and limitations.
3. Development of a hospital formulary for 300 bedded teaching hospital
4. Preparation of ABC analysis of drugs sold in one month from the pharmacy.
5. Different phases of clinical trials with elements to be evaluated.

6. Various sources of drug information and systematic approach to provide unbiased drug information.
7. Evaluation of prescriptions generated in hospital for drug interactions and find out the suitable management.

RESOURCES

REFERENCES:

1. https://jru.edu.in/studentcorner/lab-manual/dpharm/2nd-year/Hospital%20&%20Clinical%20Pharmacy.pdf
2. https://content.kopykitab.com/ebooks/2018/08/21068/sample/sample_21068.pdf
3. R.P.S. Vol.2. Part –B; Pharmacy Practice section.
4. Martin Stephens, Hospital Pharmacy, Second Edition, Pharmaceutical press, 2011.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=CMw0i3VzBpE
2. https://www.youtube.com/watch?v=aFK90DOOyGU
3. https://www.youtube.com/watch?v=WN7O5QIeqNY
4. https://www.youtube.com/watch?v=kasOF2YmxEU

WEB RESOURCES:

1. https://www.ashp.org/-/media/assets/pharmacy-practice/resource-centers/preceptor-toolkit/ sicp-busy-day-systematic-approach-answering-drug-info-requests.pdf
2. https://www.phrmafoundation.org/case-study-clinically-drug-interactions/
3. https://www.iptsalipur.org/wp-content/uploads/2020/08/BP703T_PP_V.pdf
4. https://www.teachmint.com/tfile/studymaterial/sydpharm/hcp/hcpchapter5hospitalmanufacturingpdf/d8d8c6f8-19ff-430b-92cf-11f9820c4e8f

Course Code	Course Title	L	T	P	C
23PP205005	**CLINICAL PHARMACY PRACTICAL**	**-**	**-**	**3**	**2**

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides hands-on experience on providing drug information, Interpretation of Laboratory data, Medication History Retrieval and Patient counselling practices required for patients in hospital.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Provide drug information services to health care professionals and patients

CO2. Perform patient medication reconciliation and counselling as part of pharmaceutical care practice

CO3. Interpret clinical laboratory findings and their significance in disease management

CO4. Work independently and in teams to solve problems with effective communications

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	-	2	-	-	-	-	3	-	-	-	-	-	2
CO2	3	3	-	-	2	-	-	-	-	-	-	-	-	-	-	2
CO3	3	3	-	-	2	-	-	-	-		-	-	-	-	-	2
CO4	3	3	-	-	2	-	-	-	-		-	-	-	-	-	2
Course Correlation Mapping	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	-	**3**	**-**	**-**	**-**	**-**	**-**	**2**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

LIST OF EXPERIMENTS: (Minimum 15 experiments shall be conducted)

1 Answering drug information questions (4 Nos).

2. Patient medication counselling (4 Nos).

3. Case studies related to laboratory investigations (4 Nos).

4. Patient medication history interview (3 Nos)

LIST OF ASSIGNMENT:

Students are expected to submit THREE written assignments (1500 – 2000 words) on the topics given to them covering the following areas dealt in theory class.
Drug information, Patient medication history interview, Patient medication counselling, Critical appraisal of recently published articles in the biomedical literature which deals with a drug or therapeutic issue.
Format of the assignment:

i. Minimum & Maximum number of pages.
ii. Reference(s) shall be included at the end.
iii. Assignment can be a combined presentation at the end of the academic year.
iv. It shall be computer draft copy.
v. Time allocated for presentation may be 8+2 Min.

RESOURCES

TEXT BOOKS:

1. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.
2. Rhonda M Jones Patient assessment in Pharmacy Practice, Lippincott Williams & Wilkins, 3rd edition,2016.
3. Susan M Stein Boh's Pharmacy Practice Manual: A Guide to the Clinical Experience, Wolters Kluvers, 4e,2013.
4. Sherif Hanafy Mahmoud Patient Assessment in Clinical Pharmacy: A Comprehensive Guide,S ringer, 2019.

REFERENCE BOOKS:

1. https://www.slideshare.net/anamsohail29/clinical-pharmacy-manual
2. Jeff Huges, Clinical Pharmacy a Practical Approach, The society of Hospital Pharmacists of Austaralia,2001.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=JSGDHJbN8xs
2. https://www.youtube.com/watch?v=w99qnRj_ZkY
3. https://www.youtube.com/watch?v=1LKA7EpfruE
4. https://www.youtube.com/watch?v=Na7NAk-9tu0

WEB RESOURCES:

1. https://courseware.cutm.ac.in/wp-content/uploads/2020/06/Patient-Counselling.pdf
2. https://faculty.ksu.edu.sa/sites/default/files/phone_request._Nora_K.pdf
3. https://www.aacc.org/science-and-research/clinical-chemistry/clinical-case-studies
4. http://thehub.utoronto.ca/geriatrics/wp-content/uploads/2021/08/medication-history-Medications-4.pdf

Course Code	Course Title	L	T	P
23PH205006	BIOPHARMACEUTICS AND PHARMACOKINETICS PRACTICAL	-	-	3

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course provides various skills to carry out, design and apply the concepts like compartmental modeling, noncompartmental modeling, and other methods to study the processes of drug absorption, drug distribution, drug metabolism, drug elimination.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Acquire skills to carryout Invitro dissolution studies.
CO2. Design& apply skills to know the protein binding of drugs bioavailability of drugs.
CO3. Apply appropriate formula to determine& interpret various pharmacokinetic parameters.
CO4. Apply in-vitro and ex-vivo methods to estimate the absorption of drugs.
CO5. Work independently & communicate effectively in oral and written forms.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	-	-	-	-	-	-	-	-	-	3	-	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	-	3	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-	-
CO4	3	-	3	-	-	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	-	-	-	-	3	3	-	-	3	-	-	-
Course Correlation Mapping	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**-**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

EXPERIMENTAL LEARNING

1. Improvement of dissolution characteristics of slightly soluble drugs by some methods
2. Comparison of dissolution studies of two different marketed products of same drug
3. Influence of polymorphism on solubility and dissolution
4. Protein binding studies of a highly protein bound drug and poorly protein bound drug
5. Extent of plasma-protein binding studies on the same drug (i.e. highly and poorly protein bound drug) at different concentrations in respect of constant time
6. Bioavailability studies of some commonly used drugs on animal/human model.
7. Calculation of Ka, Ke, t1/2, Cmax, AUC, AUMC, MRT etc. from blood profile data
8. Calculation of bioavailability from urinary excretion data for two drugs

9. Calculation of AUC and bioequivalence from the given data for two drugs
10. In vitro absorption studies.
11. Bio equivalency studies on the different drugs marketed. (eg) Tetracycline, Sulphamethoxzole, Trimethoprim, Aspirin etc., on animals and human volunteers.
12. Absorption studies in animal inverted intestine using various drugs
13. Effect on contact time on the plasma protein binding of drugs.
14. Studying metabolic pathways for different drugs based on elimination kinetics data.
15. Calculation of elimination half-life for different drugs by using urinary elimination data and blood level data.
16. Determination of renal clearance

RESOURCES

TEXT BOOKS:

1. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
2. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B. Jaiswal, Vallabh Prakashan Pitampura, Delhi
3. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Robert F Notari Marcel Dekker Inn, New York and Basel, 1987.

REFERENCE BOOKS:

1. Encyclopaedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James, C. Roylan, Marcel Dekker Inc, New York 1996.
2. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
3. Cilincal Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.

VIDEO LECTURES:

1. https://youtu.be/WuFy5r7B1pQ
2. https://youtu.be/x3dYISmnk5U
3. https://youtu.be/3S20pnv28ys

WEB RESOURCES:

1. https://books.google.com/books/about/Biopharmaceutics_and_Pharmacokinetics.html?id=LLpLxAEACAAJ
2. https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/absorption-distribution-metabolism-excretion-study
3. https://www.sciencedirect.com/topics/engineering/pharmacokinetic-model#:~:text=A%20pharmacokinetic%20model%20describes%20the,have%20three%20or%20fewer%20compartments.

V YEAR

Course Code	Course Title	L	T	P	C
23PP201009	CLINICAL RESEARCH	3	1	0	
Pre-Requisite	-				
Anti-Requisite	-				
Co-Requisite	-				

COURSE DESCRIPTION: Upon completion of this course the student should be able to understand Drug development process especially the phases of clinical trials and also the ethical issues involved in the conduct of clinical research. Also, it aims to impart knowledge and develop skills on conceptualizing, designing, conducting and managing clinical trials.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1	Understand drug development processes, including pharmacological and toxicological approaches, IND application, drug characterization, and dosage form formulation.
CO2.	Apply ethical guidelines in clinical research, addressing challenges, and understanding IRB/IEC composition, responsibilities, and procedures effectively.
CO3.	Conduct and manage clinical trials, including phases, post-marketing surveillance, IND submissions, ICH-GCP, and CDSCO guidelines compliance.
CO4.	Define roles and responsibilities of clinical trial personnel including sponsors, investigators, associates, auditors, coordinators, and regulatory authorities according to ICH GCP.
CO5.	Navigate regulatory environments across the USA, Europe, and India, understanding key regulatory requirements and compliance issues for clinical trials.
CO6.	Design clinical study documents, manage informed consent processes, handle data management, and monitor safety effectively throughout clinical trials.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	3	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	-	-	2	-	-	-	-	3	-	-	-	-	-	-	2	-
CO3	-	-	3	-	-	-	-	2	-	-	-	-	-	-	2	-
CO4	-	-	3	2	-	-	-	3	2	-	-	-	-	-	2	-
CO5	-	-	2	2	-	-	-	-	3		-	3	-	-	2	-
CO6	-	-	2	2	-	-	-	-	-	-	2	-	-	-	2	-
Course Correlation	-	-	2.1	2	-	-	-	2.7	2.5	-	2	3	-	-	2	-

Mapping																

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1	**Drug Development Process**	**(15 Periods)**
Introduction, Various Approaches to drug discovery - 1. Pharmacological 2. Toxicological 3. IND Application 4. Drug characterization 5. Dosage form		
Module 2	**Ethical guidelines in clinical research**	**(10 Periods)**
Challenges in the implementation of guidelines, Ethical guidelines in Clinical Research, Composition, responsibilities, procedures of IRB / IEC		
Module 3	**Clinical trials and its procedures**	**(15 Periods)**
Introduction to Clinical trials, Various phases of clinical trial, Methods of post marketing surveillance, Abbreviated New Drug Application submission, Good Clinical Practice – ICH, GCP, Central drug standard control organisation (CDSCO) guidelines		
Module 4	**Role and responsibilities of clinical trial personnel**	**(10 Periods)**
Role and responsibilities of clinical trial personnel as per ICH GCP- a. Sponsor b. Investigators c. Clinical research associate d. Auditors e. Contract research coordinators f. Regulatory authority		
Module 5	**Regulatory requirements**	**(08 Periods)**
Overview of regulatory environment in USA, Europe and India		
Module 6	**Clinical data Management**	**(17 Periods)**
Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment), Informed consent Process, Data management and its components, Safety monitoring in clinical trials.		
		Total : 75 Periods

RESOURCES

REFERENCES:	
1.	Central Drugs Standard Control Organization. Good Clinical Practices-Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2.	International Conference on Harmonisation of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996
3.	Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi
4.	Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5.	Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
6.	Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
7.	Goodman & Gilman: JG Hardman, LE Limbard, 10th Edn. McGraw Hill Publications, 2001.
VIDEO LECTURES:	
1.	https://www.youtube.com/watch?v=dTIDYIonyo4
2.	https://www.youtube.com/watch?v=fHm6uCJ_zP4
3.	https://www.youtube.com/watch?v=MDg8E7-V8_Q
4.	https://www.youtube.com/watch?v=kkElB0iDbZU
WEB RESOURCES:	
1.	https://cdsco.gov.in/opencms/opencms/en/Home/
2.	https://clinicaltrials.gov/
3.	https://www.fda.gov/patients/learn-about-drug-and-device-approvals/drug-development-process

Course Code	Course Title	L	T	P	C
23PP201010	PHARMACOEPIDEMIOLOGY AND PHARMACOECONOMICS	3	1	0	
Pre-Requisite	-				
Anti-Requisite	-				
Co-Requisite	-				

COURSE DESCRIPTION: Upon completion of this course the student should be able to understand various pharmacoepidemiological methods and their clinical applications. Also, it aims to impart knowledge on basic concepts, assumptions, terminology, and methods associated with Pharmacoeconomics and health related outcomes, and when should be appropriate Pharmacoeconomic model should be applied for a health care regimen.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1.	Understand the scope of pharmacoepidemiology, including outcome measures, drug use metrics, and adherence, for assessing prevalence, incidence, and rates of drug use.
CO2.	Assess and measure risk in pharmacoepidemiology, including concepts of attributable and relative risk, time-risk relationships, and odds ratios for accurate risk evaluation.
CO3.	Apply pharmacoepidemiological methods through theoretical understanding and practical case studies, including drug utilization reviews, cross-sectional studies, and meta-analyses.
CO4.	Utilize data sources and special applications in pharmacoepidemiological studies, including automated systems, vaccine safety, hospital settings, and risk management of drug-induced birth defects.
CO5.	Evaluate pharmacoeconomics, including historical context, role in formulary management, and various methods such as cost-minimization, cost-benefit, cost-effectiveness, and cost-utility analysis.
CO6.	Implement pharmacoeconomic applications using software and case studies to analyze and apply economic evaluations for decision-making in healthcare and formulary management.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	2	2	3	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	2	3	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	2	-	-	-	-	2	-	-	-	2	-	-	-	-	2	-
CO5	3	2	-	-	-	-	-	-	-	-	3	-	-	-	2	-
CO6	3	-	-	-	-	-	-	-	-	-	-	2	-	-	2	-
Course Correlati	2.5	2	3	-	-	2	-	-	-	2	3	2	-	-	2	-

on Mapping																

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1	**Introduction to Pharmacoepidemiology**	**(18 Periods)**
Definition and scope: Origin and evaluation of pharmacoepidemiology need for pharmacoepidemiology, aims and applications. Measurement of outcomes in pharmacoepidemiology Outcome measure and drug use measures Prevalence, incidence and incidence rate. Monetary units, number of prescriptions, units of drugs dispensed, defined daily doses and prescribed daily doses, medication adherence measurement		
Module 2	**Pharmacoepidemiological Risk assessment**	**(07 Periods)**
Concept of risk in pharmacoepidemiology Measurement of risk, attributable risk and relative risk, time-risk relationship and odds ratio		
Module 3	**Pharmacoepidemiological methods**	**(15 Periods)**
Theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods Drug utilization review, case reports, case series, surveys of drug use, cross – sectional studies, cohort studies, case control studies, case –cohort studies, meta – analysis studies, spontaneous reporting, prescription event monitoring and record linkage system.		
Module 4	**Pharmacoepidemiological studies**	**(10 Periods)**
Sources of data for pharmacoepidemiological studies Ad Hoc data sources and automated data systems. Selected special applications of pharmacoepidemiology Studies of vaccine safety, hospital pharmacoepidemiology, pharmacoepidemiology and risk management, drug induced birth defects.		
Module 5	**Phrmacoeconomics**	**(18 Periods)**
Definition, history, needs of pharmacoeconomic evaluations, Role in formulary management decisions, Pharmacoeconomic evaluation Outcome assessment and types of evaluation Includes theoretical aspects of various methods and practical study of various methods with the help of case studies for individual methods: Cost – minimization, cost- benefit, cost – effectiveness and cost utility analysis.		
Module 6	**Applications of Pharmacoeconomics**	**(07 Periods)**
Software and case studies		
		Total: 75 Periods

RESOURCES

REFERENCES:	
1.	Arnold, R.J.G. Pharmacoeconomics: From Theory to Practice (1st Edition). CRC Press.
2.	Hartzema, A.G., Tilson, H.H., & Chan, K.A. Pharmacoepidemiology And Therapeutic Risk Management (1st Edition). Harvey Whitney Books.
3.	Rascati, K.L. Essentials of Pharmacoeconomics (First edition). Wolters Kluwer India Pvt. Ltd.
4.	Revikumar, K.G. Pharmacoepidemiology and Pharmacoeconomics: Concepts and Practice. Pharma Med Press.
5.	Strom, B.L., Kimmel, S.E., & Hennessy, S. Textbook of Pharmacoepidemiology (2nd Edition). Wiley Blackwell Publications.
VIDEO LECTURES:	
1.	https://www.youtube.com/watch?v=BwuCSHRseiI
2.	https://www.youtube.com/watch?v=juG-Vyw8U5I
3.	https://www.youtube.com/watch?v=x8x448vQP7w
4.	https://www.youtube.com/watch?v=3AFTQW8mBh4
5.	https://www.youtube.com/watch?v=yb8ZiKXgtzg
WEB RESOURCES:	
1.	https://pharmareview.files.wordpress.com/2011/10/pharmacoepidemiology.pdf
2.	https://www.ikev.org/haber/farmakovijilans/Joerg%20Hasford2.pdf
3	https://pharmacy.tiu.edu.iq//wp-content/uploads/2019/02/Pharmacoeconomics-lecture-note.pdf

Course Code	Course Title	L	T	P	C
23PP201011	CLINICAL PHARMACOKINETICS AND PHARMACOTHERAPEUTIC DRUG MONITORING	2	1	0	
Pre-Requisite	-				
Anti-Requisite	-				
Co-Requisite	-				

COURSE DESCRIPTION: Upon completion of this course the student should be able to understand principles and applications of pharmacokinetics in designing the individualized dosage regimen, to interpret the plasma Drug concentration profile in altered pharmacokinetics, Drug interactions and in therapeutic Drug monitoring processes to optimize the Drug dosage regimen. Also, it enables students to understand the basic concepts of pharmacogenetics, pharmacometrics for modeling and simulation of pharmacokinetic data.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1.	Apply clinical pharmacokinetics principles to design dosage regimens, including converting between intravenous and oral dosing and adjusting for elderly, pediatric, and obese patients.
CO2.	Analyze and manage pharmacokinetic drug interactions, focusing on the inhibition and induction of drug metabolism and the impact on biliary excretion.
CO3.	Adjust drug dosages for renal and hepatic diseases by considering pharmacokinetic changes, measuring filtration rates, and accounting for extracorporeal drug removal.
CO4.	Utilize Bayesian theory and adaptive methods to analyze population pharmacokinetic data and improve dosing strategies based on population-level insights.
CO5.	Implement therapeutic drug monitoring protocols, focusing on individualizing dosage regimens, assessing variability, and correlating pharmacokinetics with pharmacodynamics for various disease conditions.
CO6.	Explore pharmacogenetics to understand genetic polymorphisms in drug metabolism and transport, and apply these considerations to pharmacokinetics and pharmacodynamics.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	2	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	2	-	3	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	3	-	-	-	-	-	-	-	-	3	-	-	-	-	2	-
CO6	2	-	-	-	-	2	-	-	-	2	-	3	-	-	2	-

Course Correlation Mapping	2.7	2.1	3	2	-	2	-	-	-	2.5	-	3	-	-	2	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1	**Clinical Pharmacokinetics and Design of dosage regimens**	**(12 Periods)**
Introduction and applications of clinical pharmacokinetics Nomograms and Tabulations in designing dosage regimen, Conversion from intravenous to oral dosing, Determination of dose and dosing intervals, Drug dosing in the elderly and pediatrics and obese patients		
Module 2	**Pharmacokinetics of Drug Interaction**	**(08 Periods)**
a. Pharmacokinetic drug interactions b. Inhibition and Induction of Drug metabolism c. Inhibition of Biliary Excretion.		
Module 3	**Dosage adjustment in Renal and hepatic Disease**	**(11 Periods)**
a. Renal impairment b. Pharmacokinetic considerations c. General approach for dosage adjustment in renal disease. d. Measurement of Glomerular Filtration rate and creatinine clearance. e. Dosage adjustment for uremic patients. f. Extracorporeal removal of drugs. g. Effect of Hepatic disease on pharmacokinetics		
Module 4	**Population Pharmacokinetics**	**(09 Periods)**
a. Introduction to Bayesian Theory. b. Adaptive method or Dosing with feedback. c. Analysis of Population pharmacokinetic Data.		
Module 5	**Therapeutic Drug monitoring**	**(13 Periods)**
a. Introduction b. Individualization of drug dosage regimen (Variability – Genetic, Age and Weight, disease, Interacting drugs). c. Indications for TDM. Protocol for TDM. d. Pharmacokinetic/Pharmacodynamic Correlation in drug therapy. e. TDM of drugs used in the following disease conditions: cardiovascular disease, Seizure disorders, Psychiatric conditions, and Organ transplantations		

Module 6	Pharmacogenetics	(07 Periods)
a. Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes. b. Genetic Polymorphism in Drug Transport and Drug Targets. c. Pharmacogenetics and Pharmacokinetics/Pharmacodynamic considerations		
		Total: 60 Periods

SOURCES

REFERENCES:	
1.	Concepts in Clinical Pharmacokinetics by Joseph T. Dipiro. 5th Edition
2.	Biopharmaceutics and Clinical Pharmacokinetics: An Introduction, Fourth Edition, by Robert T. Notari, Marcel Deckker
3.	Clinical Pharmacokinetics and Pharmacodynamics: Concepts and Applications by Malcolm Rowland, Thomas N. Tozer, Wolters Kluwer Health/Lippincott William & Wilkins
VIDEO LECTURES:	
1.	https://www.youtube.com/watch?v=8Ylgh--Ypwo
2.	https://videocast.nih.gov/watch=32073
3.	https://videocast.nih.gov/watch=32075
4.	https://videocast.nih.gov/watch=31863
5.	https://www.youtube.com/watch?v=gb2AyT0_uNs
6.	https://www.youtube.com/watch?v=7I08IjcDV8E
WEB RESOURCES:	
1.	https://uomustansiriyah.edu.iq/media/lectures/4/4_2019_02_23!03_40_49_PM.pdf
2.	https://dergipark.org.tr/tr/download/article-file/490151
3.	https://courseware.cutm.ac.in/wp-content/uploads/2020/06/THERAPEUTIC-DRUG-MONITORING-2.pdf
4.	https://www.blackwellpublishing.com/content/BPL_Images/Content_store/Sample_Chapter/9781405150460/9781405150460_4_001.pdf
5.	https://pharmacy.moh.gov.my/sites/default/files/document-upload/clinical-pharmacokinetics-pharmacy-handbook-ccph-2nd-edition-rev-2.0.pdf
6.	https://edisciplinas.usp.br/pluginfile.php/5576014/mod_resource/content/1/Dipiro%20Concepts%20In%20Clinical%20Pharmacokinetics.pdf