

Chalapathi I nstitute of Pharmaceutical Sciences Guntur

ACADEMIC RULES & REGULATIONS

(w.e.f. 2013-2014)

B.Pharmacy
(Semester System)



Chalapathi I nstitute of Pharmaceutical Sciences

Approved by AICTE, PCI, New Delhi, Chalapathi Nagar, Guntur, Andhra Pradesh, Phone:2524124,2524125,Website: www.chalapathipharmacy.in
E-mail: principalcips@gmail.com



**ACHARYA NAGARJUNA UNIVERSITY,
NAGARJUNA NAGAR, GUNTUR, Ph : 0863-2293189, 2293009**

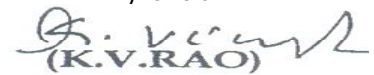
NOTIFICATION

Sub : ANU-Academic - Implementation of recommendations of
the meeting of the Board of studies in pharmacy-reg..

Ref : ANU/acad./S3/B.Pharmacy/2008, dated : 26/05/2008

This is to inform you that the standing committee to Academic senate at its meeting held on 26-04-2008 has been pleased to approve the regulations and syllabi pertaining to B.Pharmacy degree course given in schedule here to annexed. The revised syllabi and regulations shall come into effect from the academic year 2008-2009 onwards.

By order


(K.V.RAO)

Registrar

Copies to :

The Dean., Faculty of Pharmacy, ANU

The Chairman and members of the BOS in Pharmacy, ANU

The Controller of Examinations, ANU

The Co-ordinator, PG & Professional Courses, Examinations, ANU

The Assistant Registrar, PG & Professional Courses, Examinations, ANU

P.A. to Registrar, ANU,

P.A. to Vice-Chancellor, ANU

VISION, MISSION & QUALITY POLICY OF THE INSTITUTION

VISION:

To inculcate excellence in various fields of pharmacy, mould the institution as centre of excellence in terms of academics and advanced research.

MISSION:

Committed to impart quality pharmacy education and research to meet global standards

QUALITY POLICY:

Chalapathi Institute of pharmaceutical sciences is committed to impart quality pharmacy education to the growing needs of the society by implementing quality management system on a continual contact basis and continually improved services.

We shall protect the interest of our students and prepare them to meet growing challenges with increased ability to serve the nation and society.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

PEO1 Proficiency: Programme encompasses the students with profound functional knowledge in core subjects of pharmaceutical sciences like pharmaceutical chemistry, pharmaceutical analysis, pharmaceuticals, pharmacognosy, pharmacology and pharmacy practice. This enables students to be competent enough and apply these tools in pharmaceutical and health care industries, research/clinical laboratories, hospitals and community pharmacies for overall maintenance of public health.

PEO2 Practicability (Practical aptitude): Implementation of innovative teaching learning methodologies with visual aids/ computer aided tools empowers the students in understanding the concepts with clarity and transparency. Students are trained in handling sophisticated equipment and in their troubleshooting procedures, problem based learning which makes them to apply the learned theoretical concepts to real time applications and meet the current pharmaceutical industrial demand.

PEO3 Lifelong learner (Liaisons): To develop globally accepted competent students in terms of punctuality, amicability, communication skills and self learning. Students are encouraged to participate in class room seminars, group discussions, exhibitions, quizzes, conferences, symposia, seminars, workshops and health care programs. This enables the students with specific hard skills, capable of understanding the most advanced technologies, research and can integrate this knowledge and skills with contemporary needs of the society.

PEO4 Collaborator: To inculcate collective learning, knowledge sharing and knowledge transfer through their involvement in interdisciplinary research activities and to improve leadership, team work and managerial skills which helps them to play influential roles either in an organisation or in community.

PEO5 Professionalism: To promote the development of scholarly thinking, professional identity and ethics among the students for their further professional growth either in the pharmaceutical and health care industries or to pursue higher studies and research.

PROGRAMME OUTCOMES (PO's)

PO1 Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioural, social, and administrative pharmacy sciences; and manufacturing practices.

PO2 Planning Abilities: Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

PO3 Problem analysis: Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

PO4 Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

PO5 Leadership skills: Understand and consider the human reaction to change, motivation, issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.

PO6 Professional Identity: Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

PO7 Pharmaceutical Ethics: Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behaviour that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

PO8 Communication: Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective Presentations and documentation, and give and receive clear instructions.

PO9 The Pharmacist and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

PO 10 Environment and sustainability: Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO11 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self- assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

CAREERS IN PHARMACY

Pharmacy as a career option, which has always been in the forefront. Today sky is the limit for a pharma graduate. Depending on the qualification, talent and experience, there are numerous avenues for pharma professionals.

Hospital Pharmacist : Hospitals have a pharmacy department which are controlled and managed by a pharmacist. They undertake responsibility for stock control, storage, placing orders, labelling and financial budgeting and account-keeping for the dispensary.

Retail Pharmacist : The concept of pharma retailing is rapidly capturing the A and B class cities in India. These are organized retail chains under one banner and thus this calls for a good number of pharmacists to handle the entire show.

Drug Inspectors : They are employed by the state governments and they look after the day-to-day affairs of the pharma business. The job of a drug inspector includes the inspection of establishment where drugs, cosmetics, and medical devices are manufactured, handled, stored or sold to enforce legal standards of purity and grading.

Analytical Chemist : These are employed by labs which provides testing and validation about the pharma and related products.

Manufacturing Chemist : With a tremendous growth in the number of manufacturing units the demand for pharmacists is right on the top. Apart from the pharmaceutical units manufacturing chemists are also employed by allied industries such as nutraceuticals, food, cosmetics etc. The job involves to preparation of a pilot sample and see that production of a particular formulation line is right from the raw material to the end of packaging.

Medical Representatives : These are sales people who are brand ambassador for their respective companies (both national and multinational companies).

Research and Development : With India becoming a hub of R & D, this sector always looks at for the right pharma professionals. Further many more MNC's have made India as a hub for their R and D. The areas of research includes New Drug Discovery Research (NDDR), Process Development (P & D); Formulation & Development, (F&D) standardization of dosage etc.

Clinical Research : With many CRO's operations in India, clinical research is an industry itself. India is becoming a hub for clinical research; the demand for professionals in this field is growing rapidly. Clinical research business in India will be worth \$1 billion by 2010. Thus, there will soon be a massive demand for clinical research professionals, making it an interesting career option with massive growth potential.

Product Management : Managing a brand is the responsibility of product management department. Pharma professionals enjoy an added advantage over scores others in terms of suitability for this job.

Medical Transcription : Medical transcription could be one of the speedy growing IT-enabled service in India also, with the rapid change in the outlook, of Indian healthcare and privatization of the insurance sector.

Pharma Publishing : This is becoming new entrepreneurship business for pharma professionals. This involves publishing of pharma magazine/ News letters related to pharmacy topics.

Drug Regulatory : With the Indian companies going globally the role of drug regulatory department is increasing day-by-day. The job involves the preparation of drug dossier and its registration in other countries. Further knowledge of exports and imports also becomes handy in such cases. The job also involves travelling abroad for licensing and alliances.

Academics : With many colleges mushrooming all over India, teaching is a good option for those interested in academics. As per the A.I.C.T.E. norms the minimum entry-level qualification as lecturer is M.Pharma. This is a profession associated with job satisfaction and social status as teaching is considered to be noble profession. The higher posts in the hierarchy are Sr.Lecturer, Reader, Asst. Professor, Professor, Principal etc. The emoluments are satisfactory. Besides teaching academic-related opportunities involve positions on research posts and training programs.

AIMS AND OBJECTIVES OF B.PHARM COURSE

Aims :

Pharmacy graduates are required to learn and acquire adequate knowledge, necessary skills to practice the profession of pharmacy including thorough and exhaustive knowledge of synthesis and assay of Medicinal agents including mode of action, drug interactions and patient counseling and professional information exchange with Physicians and other paramedicos. The graduates are required to acquire an in-depth knowledge of formulation, storage and analysis of various pharmaceutical dosage forms including herbal medicines required for both large scale commercial production & research. The graduates should understand the concept of Community Pharmacy and be able to participate in rural and urban health care projects of State and Central government. The graduate is also required to detail the physicians and community and market the medicinal agents for diagnosis, prevention and therapeutic purposes. The pharmacist should act as bridge between Physicians and Patients and strive for better health care.

Objectives :

The objectives are covered under three headings namely :

- a. Knowledge and understanding
- b. Skills and
- c. Attitude

A. KNOWLEDGE & UNDERSTANDING :

The graduate should acquire the following during their four-year

B.Pharm course

1. Adequate knowledge and scientific information regarding basic principles of Pharmaceutical chemistry, Pharmaceutics including cosmetics, Pharmacology and Pharmacognosy including Herbal drugs.
2. Adequate knowledge of practical aspects of synthesis, formulation and analysis of various pharmaceutical and Herbal medicinal agents.
3. Adequate knowledge of practical aspects of delivering a quality assured product as per pharmacopoeia, WHO and ISO standards.
4. Adequate knowledge of practical aspects of Pharmacological screening, biological standardization and *in-vivo* drug interactions.
5. Adequate knowledge of clinical studies for patient counseling leading to physical and social well being of patients.
6. Adequate knowledge of practical aspects of product detailing and marketing of Pharmaceutical products.

B. SKILLS :

A graduate should be able to demonstrate the following skills necessary for practice of a pharmacy.

1. Able to synthesize, purify, identify and analyze medicinal agents.
2. Able to formulate, store, dispense, analyze the prescriptions and/or manufacture the medicinal agents at commercial level.
3. Able to learn and apply the quality assurance principles including legal and ethical aspects involving drugs.
4. Able to extract, purify, identify and know the therapeutic value of herbal/crude/natural products.
5. Able to screen various medicinal agents using animal models for pharmacological activity.

C. ATTITUDES :

The graduate should develop the following attitudes during their four-year B.Pharm course.

1. Willing to apply the current knowledge of Pharmacy in the best interest of patients and the community.
2. Maintain a high standard of professional ethics in discharging professional obligations.
3. Continuously upgrade professional information and be conversant with latest advances in pharmacy field to serve the community better.
4. Willing to participate in continuing education programmes of PCI and AICTE to upgrade knowledge and professional skills.
5. To help and to participate in the implementation of National Health Programmes.

REGULATIONS

01 Eligibility criteria for admission :

1.1 Candidates for admission to the degree in Bachelor of Pharmacy (B.Pharmacy) course shall be required to have passed.

(i) The Intermediate (10 + 2) Examination of the Board of Intermediate Education, Government of Andhra Pradesh or an Examination recognised as equivalent there to with Physics, Chemistry and Mathematics or Biology as subjects.

(OR)

(ii) The Diploma in Pharmacy (other than vocational) from an Institution in Andhra Pradesh recognised by the Pharmacy Council of India or a Resident of Andhra Pradesh with a Diploma in Pharmacy from outside Andhra Pradesh.

1.2 Admission into first year B. Pharmacy course will be decided based on EAMCET Score for Intermediate candidates and on the rank or mark obtained in the Entrance Test for Diploma candidates.

1.3 Diploma in Pharmacy candidates may be admitted upto 10% of the seats permitted and the remaining seats are to be allocated to Intermediate M.P.C. and Bi.P.C. candidates in the ratio 1 : 1.

1.4 Reservation for admissions will be as per the Government Rules.

02 Duration of the Course :

The degree of Bachelor of Pharmacy will be conferred on the candidate who have subsequently undergone the prescribed course of study of the Acharya Nagarjuna University for a period of four academic years and three academic years for those admitted to II B.Pharmacy directly. The course of study is as prescribed under scheme of instruction and syllabus.

03. Academic Work :

i Instruction and Examination in each academic year is spread over two semesters with a minimum of 90 working days in each semester (180 days in any given academic year). However in the case of semester I and II of B.Pharmacy the instruction and examination shall be organized simultaneously spread over the entire academic year of 180 days to save time that may be lost due to possible delay in the admission process.

ii Each period of instruction is of 50 minutes. Seven periods of instruction are provided on each day and there are six working days in a week (Monday to Saturday)

04. Attendance Requirements : A regular course of study during an academic semester means a minimum of average attendance of 75% of all the courses of the semester computed by totaling the number of periods of lectures and practicals, as the case may be, held in every course. In special cases where sufficient causes were shown, the Vice-Chancellor may on the recommendation of the principal concerned condone the deficiency in the average attendance to an extent of 10% for reasons such as ill health, if the application for condonation is submitted at the time of actual illness and is supported by certificate of authorized Medical Officer approved by the Principal. However, in the case of students, who participate in activities like N.S.S., N.C.C., Inter-Collegiate tournaments conducted by Acharya Nagarjuna University, Inter-University tournaments conducted by Inter-University Board and any such other activities involving the representation of the College/ University with the prior approval of the principal, the candidate may be deemed to have attended the college during the period solely for the purpose of the examination.

- i. A candidate who cannot satisfy the attendance requirements in clause 05 because of late admission under special circumstances reasonable and acceptable to the University on the basis of document, shall fulfill the following conditions: Average attendance : A candidate shall have attended at least a total of 90% of the periods-lectures/practicals as the case may be held from the date of admission and also shall attend at least 50% of the total working days during that academic semester (Late admission means, admissions made after 45 days from date of commencement of the academic semester for the course).
- ii. If any candidate fails to satisfy the regulation under 05 or 06 she/he shall not be allowed for the university Examinations at the end of the semester, and he/she shall not be allowed for promotion to the next higher class of study. He/she shall be required to repeat the regular course of study of that academic semester along with the next regular batch.

05. Examinations : Assessment for the award of degree shall consists of
(a) Internal evaluation for 20 marks in each of the theory and practical courses separately as detailed in the scheme of examination.
(b) Semester-end examination as detailed in the scheme of examination for 80 marks in each of the theory and practical.

- i. **Regulations concerning sessional examination:** (a) There shall be two sessional examinations in each theory course and the best of the two shall be taken; (b) The marks for the internal evaluation for the practical are awarded based on the continuous assessment of the performance of the candidate at the practical classes and the records. The marks certificate issued to the candidate by University shall show separately the sessional marks, the semester-end examination marks and the aggregate of both; (c) The teacher who teaches the subject shall ordinarily be internal examiner; (d) There shall be no provision for the improvement of the sessional marks.
- ii. **Regulations concerning semester-end examination:** (a) There shall be one semester-end examination in each theory course based on the question paper set by an external paper setter and it shall be evaluated by an internal examiner. There shall be one semester-end examination in each practical course and the one external. The duration of the practical examination may be of 4 to 6 hours as prescribed.
There shall be supplementary examination. A student shall be eligible for promotion to III. Pharmacy Course if he/she has passed all but 3 subjects of I B.Pharmacy (I & II semesters put together, including practical subjects) in addition to satisfying the minimum requirement of attendance. A student shall be eligible for promotion to IV B.Pharmacy course if he/she has satisfied the minimum requirements of attendance in III B.Pharmacy and has passed all but 3 subjects of II B.Pharm (3rd & 4th semesters put together, including practical subjects) and passed all but 1 subject of I B.Pharmacy.
- iii. A candidate shall be declared to have passed the examination in each semester if he obtains (i) not less than 40% marks in each theory and 40% in each practical of the semester-end examinations in addition to 50% aggregate including theory and practicals of internal and annual examinations.
- iv. A candidate may be permitted to improve his performance in semester-end examination of any semester only after completing the entire eight semester course of study by appearing again for the whole examinations of that semester only during four subsequent years after completion of the study of the entire course. Such an improvement can be availed only once for each one of the semester examinations of the entire course of study. When considered in its totality the better of the two performances as whole at the I, II, III, IV, V, VI, VII or VIII semesters as the case may be shall be taken into consideration for the purpose of awarding the grade.

v. The courses 101 (A) Mathematics, 101 (B) Biology Theory and 101 (C) Biology Practicals are bridge courses for candidates with only biology and with only mathematics background respectively at the intermediate level.

vi. Any candidate who carried a backlog at any stage will not be eligible for rank, medal or prizes to be awarded by the University. First attempt means appearance at the first examinations conducted for the particular batch.

06. Industrial Training :

Every candidate shall undergo practical training for at least one month in pharmaceutical factory/Pharmaceutical concern / hospital / clinical lab at the end of the final semester of the course.

07. Industrial Tour :

Candidates studying in final year of the course shall visit several Pharmaceutical manufacturing houses as a supplement to their academic training and submit a report to the satisfaction of the Head of the institution where he/she has studied.

A candidate is declared to have passed if he/she gets a minimum of E-grade in each paper (Theory/Practical/Project) and also minimum SGPA of 6.0 points (D-Grade) in any semester. A candidate who fails to secure minimum SGPA of 6.0 points (D-Grade), he/she has to reappear for all the papers where he/she secured E-grade.

COURSE OUTCOMES
PROGRAMME: B.PHARMACY
BATCHES: 2013-17, 2014-18, 2015-19

Course Name : Mathematics [Bridge course] (Theory)
Course code : 101A
Year of Study : 2014-15, I.B.Pharmacy, 1st and 2nd Semesters

C101.1	To outline the concepts of mathematics and their application in pharmacy.
C101.2	To illustrate different types of problems by applying mathematics.
C101.3	To apply both conventional and creative techniques to solve problems in mathematics.
C101.4	To correlate the mathematical tools in wide professional views and solve problems of trigonometry, calculus and matrices.
C101.5	To measure the range of techniques effectively to solve problems including theory of deduction, approximation and simulation.
C101.6	To plan and design problems in mathematics that promote logical thinking.

Course Name : Biology [Bridge course] (Theory)
Course code : 101B
Year of Study : 2014-15, I.B.Pharmacy, 1st and 2nd Semesters

C101.1	To understand the cell structure, cellular inclusions and the process of mitosis and meiosis in animals.
C101.2	To classify plant and animal kingdom and to analyze the structure of bacteria, yeast, amoeba, paramecium and earthworm.
C101.3	To acquire the knowledge of taxonomic characteristics of plants belong to solanaceae and umbelliferae.
C101.4	To analyze morphology and functions of various plant parts such as root, stem, leaf, flower, fruit and seed.
C101.5	To elaborate the methods of pollination and the process of inflorescence.
C101.6	To identify the structure of various parasites such as entamoeba, plasmodium, trypanosoma and ascaris.

Course Name : Biology [Bridge course] (Practical)	
Course code : 101C	
Year of Study : 2014-15, I.B.Pharmacy, 1 st and 2 nd Semesters	
C101.1	To understand the function and operation of microscope.
C101.2	To describe the plants belong to angiosperm family.
C101.3	To perform microscope evaluation of different plant tissues and primary anatomical structure of root, stem and leaf.
C101.4	To perform microscopic and macroscopic examination and identification of root, stem and leaf.
C101.5	To dissect earthworm and identify the digestive and nervous systems.
C101.6	To design and develop herbarium of selected plant species.
Course Name : Pharmaceutical Chemistry-I [Organic-I] (Theory)	
Course code : 102	
Year of Study : 2014-15, I.B.Pharmacy, 1 st and 2 nd Semesters	
C102.1	To recall basic principles of atomic structure, electronic configuration, reactive intermediates and electron displacement effects.
C102.2	To apply the knowledge of reactive intermediates and attacking reagents in different organic reactions.
C102.3	To illustrate the IUPAC nomenclature of different organic compounds.
C102.4	To build the knowledge of essential reactions to prepare organic compounds.
C102.5	To distinguish different substitution and elimination reactions and to examine the several identification tests of organic compounds.
C102.6	To elaborate different named reactions and its applications in carbonyl compounds and carboxylic acids.

Course Name : Pharmaceutical Chemistry-I[Organic-I] (Practical)	
Course code : 103	
Year of Study : 2014-15, I.B.Pharmacy, 1 st and 2 nd Semesters	
C103.1	To explain laboratory safety guidelines, apparatus and glassware used in pharmaceutical chemistry laboratory.
C103.2	To illustrate the determination of physical constants of organic compounds.
C103.3	To demonstrate various filtration and crystallization techniques.
C103.4	To synthesize and purify the selected organic compounds and to determine the reaction mechanisms.
C103.5	To analyze mono functional group pharmaceutical organic compounds by systematic qualitative analysis.
Course Name : Physical pharmacy-I (Theory)	
Course code : 104	
Year of Study : 2014-15, I.B.Pharmacy, 1 st and 2 nd Semesters	
C104.1	To recall the intermolecular forces and states of matter, phase equilibrium and phase rule.
C104.2	To explain laws of thermodynamics, free energy functions and applications.
C104.3	To explain the electromotive force, pH, oxidation - reduction systems and buffered isotonic systems.
C104.4	To relate the different viscometers and compare viscosities.
C104.5	To construct gablenski diagram and relate Beer-Lamberts law to the concepts of photochemistry.
C104.6	To enumerate physical properties of drug molecules and properties of solutions of electrolytes.

Course Name : Physical pharmacy-I (Practical)	
Course code : 105	
Year of Study : 2014-15, I.B.Pharmacy, 1 st and 2 nd Semesters	
C105.1	To match the solubility of salicylic acid in various solvents.
C105.2	To illustrate the density of the given solid and liquid samples.
C105.3	To apply the given data for the determination of pKa by half neutralization and graphical methods.
C105.4	To compare the surface tension determined by drop number and drop count methods.
C105.5	To assess the viscosity of the given sample using Ostwald's viscometer.
C105.6	To establish an upper consolute temperature for phenol water system and to study the effect of sodium chloride on critical solution temperature.
Course Name : Computer Applications and Statistical Methods (Theory)	
Course code : 106	
Year of Study : 2014-15, I.B.Pharmacy, 1 st and 2 nd Semesters	
C106.1	To relate measures of location, dispersions and to match grouped and ungrouped data cases.
C106.2	To understand the fundamentals of BASIC and C languages.
C106.3	To illustrate probability, distribution and non parametric tests such as T test, Chi Square test and F test and their significance.
C106.4	To compute and interpret, results of bivariate and multivariate regression and correlation analysis.
C106.5	To demonstrate the types of characteristics and various components of computers.
C106.6	To create the knowledge of various statistical methods and computer knowledge in pharmacy.

Course Name : Pharmaceutics – I [General Pharmacy including dispensing] (Theory)	
Course code : 201	
Year of Study : 2014-15, I.B.Pharmacy, 1 st and 2 nd Semesters	
C201.1	To classify different dosage forms and know the purpose of additives in the formulation.
C201.2	To understand the concepts of formulation, methods of preparation of liquid dosage forms.
C201.3	To analyze the problems involved in dispensing of powders and methods to overcome and learn the official formulations.
C201.4	To elaborate different types of suppositories, suppository bases, manufacturing methods and uses of suppositories.
C201.5	To discuss the concepts of weights and measures, inter conversions and pharmaceutical calculations appropriately and pharmacy profession.
C201.6	To devise the extraction process and prepare galenicals and to elaborate the concepts of packaging.
Course Name : Pharmaceutics – I [General Pharmacy including dispensing] (Practical);	
Course code : 202	
Year of Study : 2014-15, I.B.Pharmacy, 1 st and 2 nd Semesters	
C202.1	To recall and recognize the concepts related to dosage forms like monophasic and biphasic liquid dosage forms.
C202.2	To use the compounding and dispensing methods for liquid orals.
C202.3	To apply the knowledge of principles and procedures to prepare emulsions and suspensions.
C202.4	To elucidate the compounding of suppositories.
C202.5	To prepare and dispense the liquid dosage forms for external applications.
C202.6	To discuss the concepts and principles in the compounding and dispensing of liquid dosage forms for instillation.

Course Name : Pharmaceutical Analysis – I (Theory);	
Course code : 203	
Year of Study : 2014-15, I.B.Pharmacy, 1 st and 2 nd Semesters	
C203.1	To define and differentiate terminologies in pharmaceutical analysis.
C203.2	To classify different types of analytical techniques, errors and limit tests.
C203.3	To apply various theoretical concepts and principles involved in limit tests.
C203.4	To examine the importance of computation of analytical results, stoichiometric analytical problems and pH of buffers.
C203.5	To estimate various pharmaceutical compounds using acid -base, complexometric, non-aqueous, gravimetric techniques, redox, precipitation and diazotization titrations.
C203.6	To elaborate the importance of Good laboratory Practices (GLP), gas analysis, moisture and alcohol content.
Course Name : Pharmaceutical Analysis – I (Practical);	
Course code : 204	
Year of Study : 2014-15, I.B.Pharmacy, 1 st and 2 nd Semesters	
C204.1	To choose appropriate primary and secondary standards in standardization and calibration methods.
C204.2	To determine the different limit tests and titrations.
C204.3	To experiment with acid-base, redox, complexometric and limit tests.
C204.4	To analyze different limits of impurities using limit tests.
C204.5	To explain about GLP and estimate active pharmaceutical ingredient in pharmaceutical dosage forms.
C204.6	To establish the importance of significant figures and computation of analytical data.

Course Name : Environmental Sciences (Theory);	
Course code : 205	
Year of Study : 2014-15, I.B.Pharmacy, 1 st and 2 nd Semesters	
C205.1	To explain characteristic features, structures and functions of ecosystems.
C205.2	To compare various environment and natural resources management.
C205.3	To develop knowledge on biodiversity and in conservation to improve the global environment.
C205.4	To categorize local and global issues and environmental pollutions and to assess the impact of economy.
C205.5	To distinguish various environmental acts and monitoring of environmental convergence.
C205.6	To discuss the effects of environmental problems and their impact on society.
Course Name : Pharmaceutical Chemistry – II [Organic – II] (Theory)	
Course code : 301	
Year of Study : 2015-16, II.B.Pharmacy, Third Semester.	
C301.1	To define the nomenclature, preparation, reactions and uses of heterocyclic compounds.
C301.2	To explain the rules of aromaticity, preparation methods and reactions of organic compounds.
C301.3	To utilize the various reagents and study their applications in organic synthesis.
C301.4	To categorize medicinal compounds based on their structure and medicinal uses.
C301.5	To explain the concept of stereochemistry.
C301.6	To create interest in polynuclear aromatic hydrocarbons and named reactions.

Course Name : Pharmaceutical chemistry-II (Practical);	
Course code : 302	
Year of Study : 2015-16, II.B.Pharmacy, Third Semester.	
C302.1	To recall the uses of various reagents in the synthesis of organic compounds.
C302.2	To explain qualitative analysis of organic compounds.
C302.3	To experiment with the separation of organic binary mixture.
C302.4	To build the synthesis of organic compounds by known reactions.
C302.5	To analyze mixtures of pharmaceutical organic compounds.
C302.6	To elaborate the significance of various aspects of stereochemistry and poly nuclear hydrocarbons.
Course Name : Pharmaceutical Engineering – I (Theory);	
Course code : 303	
Year of Study : 2015-16, II.B.Pharmacy, Third Semester.	
C303.1	To outline the fundamentals of material and energy balance, units and dimensions in engineering calculations.
C303.2	To gain knowledge on unit operations, unit processes, chemical technology, laboratory, pilot scale and industrial scale operations.
C303.3	To compare flow of fluids; transportation of solids and fluids.
C303.4	To understand the important materials used in pharmaceutical plant construction.
C303.5	To explain the concept of corrosion and predict the industrial hazards.
C303.6	To elaborate the concepts of humidity and air conditioning, size reduction, size separation and mixing.

Course Name : Pharmaceutical Microbiology (Theory);	
Course code : 304	
Year of Study : 2015-16, II.B.Pharmacy, Third Semester.	
C304.1	To find and select the desired or useful microorganism and sterilization methods.
C304.2	To relate the mechanisms of drug action (anti microbial) to the new substances derived.
C304.3	To develop different screening methods to identify disease state.
C304.4	To analyze the given anti microbial agent for its effective concentrations.
C304.5	To evaluate the bacteriostatic and cidal effects of new compounds.
C304.6	To solve the problem of spread of infections by creating awareness on possible outbreaks of different diseases.
Course Name : Pharmaceutical Microbiology (Practical);	
Course code : 305	
Year of Study : 2015-16, II.B.Pharmacy, Third Semester.	
C305.1	To select suitable sterilization procedure for sterilizing different pharmaceutical preparations.
C305.2	To demonstrate aseptic transfer and screening methods.
C305.3	To experimentally determine the characteristic features of microbes with respect to staining.
C305.4	To test the efficiency of antimicrobial agents.
C305.5	To determine the sensitivity of organisms to antibiotics and new compounds.
C305.6	To design experimental procedures to identify unknown compounds for antimicrobial activity.

Course Name : Anatomy and Physiology (Theory);	
Course code : 306	
Year of Study : 2015-16, II.B.Pharmacy, Third Semester.	
C306.1	To understand characteristics of different types of tissues and their location in various organs, transport processes across the cell membrane.
C306.2	To elaborate the process of impulse transmission in central and peripheral nervous system and reflex arc.
C306.3	To appraise the physiology of heart and regulation of blood pressure.
C306.4	To evaluate the process of respiration, gas exchange and role of enzymes involved in digestion.
C306.5	To interpret the process of formation of urine and appraise function of various hormones.
C306.6	To improve the knowledge on physiology of various sense organs.
Course Name : Anatomy and Physiology (Practical);	
Course code : 307	
Year of Study : 2015-16, II.B.Pharmacy, Third Semester.	
C307.1	To understand the usage of compound microscope.
C307.2	To classify various tissues based on their characteristics by observing them under microscope.
C307.3	To estimate the physiological conditions of human body by recording heart rate, pulse rate, blood pressure, bleeding and clotting time.
C307.4	To determine the RBC and WBC in human blood.
C307.5	To estimate the DLC and ESR of human blood sample.
C307.6	To appreciate the working pattern of sense organs in coordination with nervous system.

Course Name : Pharmaceutical Chemistry – III [Medicinal – I] (Theory)	
Course code : 401,	
Year of Study : 2015-16, II.B.Pharmacy, Fourth Semester.	
C401.1	To remember various classes of medicinal compounds, their properties and clinical uses.
C401.2	To compare the physicochemical parameters of drugs with biological action.
C401.3	To interpret the relationship between the structure and biological activity of selected categories of drugs.
C401.4	To apply the knowledge of medicinal compounds and their mechanism of action in the treatment of various diseases.
C401.5	To design the synthetic routes for medicinal compounds.
C401.6	To discuss the various plant products used in chemotherapy.
Course Name : Physical Pharmacy – II (Theory);	
Course code : 402	
Year of Study : 2015-16, II.B.Pharmacy, Fourth Semester.	
C402.1	To state the solubility and distribution phenomenon and to describe the complexation.
C402.2	To summarize the methods and principles of stabilization, rates and orders of reaction.
C402.3	To understand and apply the interfacial phenomenon.
C402.4	To compare the types and properties of colloids and macromolecular systems.
C402.5	To justify the micromeritics of powders as well as rheological systems.
C402.6	To evaluate the course dispersions and to predict their rheological and interfacial properties.

Course Name : Physical Pharmacy – II (Practical);	
Course code : 403	
Year of Study : 2015-16, II.B.Pharmacy, Fourth Semester.	
C403.1	To understand the concept of surface tension and stability of coarse dispersions.
C403.2	To recognize the micromeritics of powders, determine the globule size of an emulsion and the effect of phase volume ratio on stability of emulsion.
C403.3	To study and relate the accelerated stability testing of tablet formulations.
C403.4	To assess the HLB value, critical micellar concentration of surfactants and explain complexation phenomenon.
C403.5	To study the adsorption of oxalic acid on charcoal and to evaluate the particle size by stokes method.
C403.6	To determine the first order rate constant associated with decomposition of pharmaceuticals.
Course Name : Applied biochemistry and clinical pathology (Theory)	
Course code : 404,	
Year of Study : 2015-16, II.B.Pharmacy, Fourth Semester.	
C404.1	To remember the properties, biological significance and metabolic reactions of carbohydrates, amino acids, proteins and lipids.
C404.2	To understand the biological role of vitamins, minerals and hormones.
C404.3	To apply the concept of catalytic activity and enzyme inhibition in design of new drugs and factors affecting enzyme action.
C404.4	To distinguish the phases and mechanism of detoxification.
C404.5	To appraise the principles and clinical significance involved in the analysis of blood and urine samples.
C404.6	To discuss the metabolism of carbohydrates, amino acids, proteins and lipids in the body.

Course Name : Applied biochemistry and clinical pathology (Practical)	
Course code : 405,	
Year of Study : 2015-16, II.B.Pharmacy, Fourth Semester.	
C405.1	To remember the effect of temperature, pH and substrate concentration on salivary amylase activity.
C405.2	To understand the qualitative analysis of carbohydrates, proteins and amino acids.
C405.3	To identify the amount of glucose present in urine by BQR method.
C405.4	To examine the constituents present in the urine and its clinical significance.
C405.5	To determine tyrosine using calorimeter and valine by formal titration.
C405.6	To elaborate the clinical significance of serum cholesterol, glucose and creatinine in blood and urine samples.
Course Name : Forensic Pharmacy (Theory);	
Course code : 406	
Year of Study : 2015-16, II.B.Pharmacy, Fourth Semester.	
C406.1	To remember the code of ethics of pharmacist, legislation to regulate the profession of pharmacy.
C406.2	To explain the pharmacy act 1948 and outline various professional bodies, their constitution and functions.
C406.3	To describe the Drugs and cosmetics act 1940, Drugs and cosmetic rules 1945 and list various schedules.
C406.4	To explain other legislations relating to pharmaceutical industry and profession such as Indian patent and designs act 1970, Medical termination of pregnancy act, Shops and establishments act and prevention of cruelty to animals act.
C406.5	To discuss legislations to control the advertisements, excise duties and price of drugs.
C406.6	To elaborate the legislations to control the operations regulating the dangerous drugs, poisons and opium.

Course Name : English and communication skills [Language laboratory] (Practical)	
Course code : 407,	
Year of Study : 2015-16 II.B.Pharmacy, Fourth Semester.	
C407.1	To understand the basic concepts of functional and advance grammar.
C407.2	To learn different levels of vocabulary and to remember synonyms and antonyms of basic words.
C407.3	To pronounce words with proper accent and to understand the common errors in pronunciation.
C407.4	To apply verbal and non verbal communication skills in presentation.
C407.5	To speak and write confidently using communication principles.
C407.6	To develop skills required for preparing a resume and handling an interview.
Course Name : Pharmaceutical Chemistry – IV [Medicinal – II] (Theory);	
Course code : 501,	
Year of Study : 2016-2017, III.B.Pharmacy, Fifth Semester.	
C501.1	To explain the classification of drugs by quoting some examples.
C501.2	To define and write chemistry, mode of action and therapeutic uses of drugs.
C501.3	To relate the structural modifications of the drugs with their biological activity.
C501.4	To outline the synthetic schemes for medicinal compounds.
C501.5	To adopt various drug discovery approaches in designing new molecules.
C501.6	To discuss the importance of physicochemical properties in relation to drug action.

Course Name	:	Pharmaceutical Chemistry – IV [Medicinal – II] (Practical);
Course code	:	502,
Year of Study	:	2016-2017, III.B.Pharmacy, Fifth Semester.
C502.1		To outline the techniques involved in synthesis of drugs.
C502.2		To explain the mole calculation and yield of drugs.
C502.3		To experiment with the synthesis and analysis of selected medicinal compounds.
C502.4		To determine the actual concentration of reagent used in drug analysis.
C502.5		To judge the label claim of marketed formulations after performing assay.
Course Name	:	Pharmaceutics – II (Dosage form technology including cosmetics) (Theory)
Course code	:	503,
Year of Study	:	2016-2017, III.B.Pharmacy, Fifth Semester.
C503.1		To recollect the preformulation parameters and types of bases used in the preparation of ointments, pastes and creams.
C503.2		To describe the production of biphasic liquid dosage forms.
C503.3		To apply the principles of manufacture in the production of solid dosage forms viz tablets and capsules.
C503.4		To formulate and evaluate cosmetics.
C503.5		To formulate and evaluate parenterals and ophthalmic products.
C503.6		To design and develop radiopharmaceuticals and aerosol preparations.

Course Name : Pharmaceutics – II (Dosage form technology including cosmetics) (Practical)	
Course code : 504,	
Year of Study : 2016-2017, III.B.Pharmacy, Fifth Semester.	
C504.1	To recall the formulation, manufacturing requirements of solid, liquid and semi solid dosage forms.
C504.2	To explain formulation of various types of tablets and capsules.
C504.3	To utilize the additives for the formulation of liquid orals, creams and shampoos.
C504.4	To elaborate the preparation and sterilization of parenterals.
C504.5	To perform evaluation tests for tablets and capsules.
C504.6	To formulate ointments and gels.
Course Name : Pharmacognosy - I (Theory);	
Course code : 505	
Year of Study : 2016-17, III.B.Pharmacy, Fifth Semester.	
C505.1	To understand the scope and development of pharmacognosy.
C505.2	To illustrate cultivation, collection and processing of crude drugs.
C505.3	To build the systematic pharmacognostic study of crude drugs such as carbohydrates, proteins, enzymes, tannins, resins and fibers.
C505.4	To analyze the quality of crude drugs by various methods.
C505.5	To relate metabolic pathways for the formation of secondary metabolites.
C505.6	To create and evaluate the crude drugs by identifying the types of adulterants using different methods.

Course Name : Pharmacognosy - I (Practical);	
Course code : 506	
Year of Study : 2016-17, III.B.Pharmacy, Fifth Semester.	
C506.1	To remember different morphological and microscopical characteristic features of crude drugs.
C506.2	To classify the wide variety of crude drugs and their sources by different characters.
C506.3	To understand the cellular structure of crude drugs.
C506.4	To evaluate the crude drugs by quantitative evaluation methods.
C506.5	To evaluate the crude drugs by physical methods of evaluation.
Course Name : Pharmacology – I (Theory);	
Course code : 507	
Year of Study : 2016-17, III.B.Pharmacy, Fifth Semester.	
C507.1	To understand the concepts of routes of administration, drug interaction, ADRs, SAR, receptors, drug toxicity, agonism and antagonism.
C507.2	To summarize the pharmacology of drugs acting on autonomic nervous system.
C507.3	To identify the effect of drugs used as local anesthetics and diuretics.
C507.4	To categorize the pharmacology of major classes of drugs acting as general anesthetics, analgesics and anti inflammatory agents.
C507.5	To appraise the pharmacology of drugs acting on central nervous system.
C507.6	To predict the affect of various drugs acting against gastro intestinal complications.

Course Name : Pharmaceutical Engineering – II (Theory);	
Course Code : 601	
Year of Study : 2016-2017, III.B.Pharmacy, Sixth Semester.	
C601.1	To recall the mechanisms of heat transfer.
C601.2	To illustrate the mechanisms of drying, operation and applications of various dryers.
C601.3	To apply the principle of evaporation in the working of different evaporators.
C601.4	To analyze the principle and working of distillators and their applications.
C601.5	To assess the role of solubility curve in the selection of crystallizers.
C601.6	To assemble the extraction, centrifugation and filtration equipment and to explain their working processes.
Course Name : Pharmaceutical Engineering – II (Practical);	
Course code : 602	
Year of Study : 2016-2017, III.B.Pharmacy, Sixth Semester.	
C602.1	To describe the equipment related to heat transfer, milling, filtration, drying, crystallization, evaporation and extraction.
C602.2	To summarize the factors affecting the rate of filtration and centrifugation.
C602.3	To determine wet bulb and dry bulb temperatures and to plot the humidity charts.
C602.4	To calculate the radiation constant, rate of evaporation and crystallization.
C602.5	To analyze the moisture content, drying rate from the drying curves.
C602.6	To evaluate the size separation by sieving method and size reduction by ball mill.

Course Name : Pharmaceutical Biotechnology (Theory);	
Course code : 603	
Year of Study : 2016-2017, III.B.Pharmacy, Sixth Semester.	
C603.1	To find out different microbial conversions and relate the conversions that result in pharmaceutically important products.
C603.2	To be able to outline series of steps involved in fermentative production.
C603.3	To apply his/her knowledge in selection methods for good product outcomes and stabilize enzymes in a reaction.
C603.4	To be able to perform tests, to identify and assay the given pharmaceutical products with respect to microbes.
C603.5	To identify the importance of biotechnology methods in pharmacy.
C603.6	To develop possible biotechnological products important for human well being and schemes for their production.
Course Name : Pharmaceutical Biotechnology (Practical);	
Course code : 604	
Year of Study : 2016-2017, III.B.Pharmacy, Sixth Semester.	
C604.1	To select appropriate method of testing and characterizing the contamination in pharmaceutical products.
C604.2	To interpret the results by comparing with the standards given.
C604.3	To develop experimental evidence for identification of microorganisms present in a given pharmaceutical product.
C604.4	To conclude the results thus obtained through experiments.
C604.5	To test the sterility of compounds and perform microbiological assays.
C604.6	To design experiments of need to solve the given problems.

Course Name : Hospital and clinical pharmacy (Theory);	
Course code : 605	
Year of Study : 2016-2017, III.B.Pharmacy, Sixth Semester.	
C605.1	To acquire the knowledge on hospitals and their organization, drug distribution systems in hospitals and hospital formulary.
C605.2	To understand techniques of manufacturing sterile products and methods to overcome incompatibilities.
C605.3	To demonstrate the knowledge of therapeutic drug monitoring, patient counseling, medication history interview and drug information resources and extend it for societal needs.
C605.4	To elaborate clinical aspects of selected disease states (etiology, pathogenesis, patient counseling) and aware of rational use of drugs.
C605.5	To evaluate pharmacokinetic and pharmacodynamic drug interactions and adverse drug reactions.
C605.6	To build the ability to handle prescription.
Course Name : Hospital and clinical pharmacy (Practical);	
Course code : 606	
Year of Study : 2016-2017, III.B.Pharmacy, Sixth Semester.	
C606.1	To gain the knowledge on weights and measures and to understand Latin terminology used in prescriptions.
C606.2	To get familiarize with dispensing of powders and to perform dosage calculations.
C606.3	To be able to prepare and dispense powders, mixtures, emulsions, ointments and parenterals.
C606.4	To plan workflow process in the dispensary of a hospital, handle prescriptions and identify disease conditions.
C606.5	To explain drug distribution methods and to identify the pharmaceutical incompatibilities.
C606.6	To build the ability to run a hospital pharmacy and to disseminate drug information.

Course Name : Seminar,	
Course code : 607	
Year of Study : 2016-2017, III.B.Pharmacy, Sixth Semester.	
C607.1	To recall the basic knowledge on the allotted seminar topic.
C607.2	To develop students communication skills and to develop interpersonal skills.
C607.3	To encourage the students to practice self learning, leadership skills and use of computer aids for making the presentation.
C607.4	To build the competence in core subject areas of pharmaceutical sciences.
C607.5	To make the students capable to showcase their team spirit.
C607.6	To provide an avenue to upgrade the student in becoming an orator.
Course Name : Pharmaceutics – III (Theory);	
Course code : 701	
Year of Study : 2017-2018, IV.B.Pharmacy, Seventh Semester.	
C701.1	To recall basic concepts of drug absorption, disposition and modified drug release dosage forms.
C701.2	To understand various pathways of drug absorption, disposition and summarize the factors affecting pharmacokinetics of drugs.
C701.3	To apply the pharmacokinetic models for determination of various pharmacokinetic parameters.
C701.4	To analyze the bioavailability parameters of drugs that follows linear and non linear pharmacokinetics.
C701.5	To interpret the factors influencing the design of sustained and controlled release dosage forms.
C701.6	To formulate various oral, parenteral and topical novel drug delivery systems.

Course Name : Pharmaceutics – III (Practical);	
Course code : 702	
Year of Study : 2017-2018, IV.B.Pharmacy, Seventh Semester.	
C702.1	To find the drug release from various dosage forms and relate various factors affecting drug release.
C702.2	To understand the relationship between pH, pKa and percent ionization of drugs.
C702.3	To apply pharmacokinetic models for determination of K_a , K_e , $t_{1/2}$, V_D , CLT, MRT of drugs.
C702.4	To determine the bioavailability and bioequivalence of formulations from the given plasma and urine data.
C702.5	To construct the standard graph of sulfamethoxazole in plasma.
C702.6	To formulate novel drug delivery systems for improving bioavailability.
Course Name : Pharmacology – II (Theory);	
Course code : 703	
Year of Study : 2017-2018, IV.B.Pharmacy, Seventh Semester.	
C703.1	To summarize the theoretical considerations and principles of biological assays.
C703.2	To identify the relative pros and cons in the use of drugs for various cardiac complications.
C703.3	To outline the major classes of drugs currently used in medical practice for treatment of allergic reactions and respiratory complications.
C703.4	To analyze the mechanism of action of chemotherapeutic agents and their role in the treatment of various infectious diseases.
C703.5	To assess the selection of most appropriate drugs for effective pharmacotherapy of various hormone related complications.
C703.6	To predict the basic principles of toxicology and clinically managing the poisoned patient.

Course Name : Pharmacology – II (Practical);	
Course code : 704	
Year of Study : 2017-2018, IV.B.Pharmacy, Seventh Semester.	
C704.1	To remember and learn basic as well as advanced equipments used in experimental pharmacology.
C704.2	To interpret the effects of various drugs (including local anesthetics) on rabbit eye in correlation with humans.
C704.3	To demonstrate the dose response relationships using living/ isolated animal tissue preparation.
C704.4	To analyze the drug concentrations by various bioassay methods using animal simulator softwares.
C704.5	To adapt the importance of ethical requirements for performing animal experiments and biological waste management.
C704.6	To predict the effect of agonist and antagonist on dose response curve.
Course Name : Pharmaceutical Analysis – II (Theory);	
Course code : 705	
Year of Study : 2017-2018, IV.B.Pharmacy, Seventh Semester.	
C705.1	To understand selected instrumental analytical techniques (spectroscopic, chromatographic, electrochemical methods) and differentiate with volumetric analytical techniques.
C705.2	To gain knowledge on interaction of EMR with matter, affinity of matter with stationary phase and mobile phase, physical and chemical properties of matter, potential and conductivity differences in different aqueous and organic solutions.
C705.3	To build the analytical understanding at the level of atom, group and molecular structure of organic and inorganic compounds with different functional groups and their applications in pharmacy.
C705.4	To categorize different organic and inorganic compounds using suitable spectroscopy, chromatography, electrochemical, thermal and radio immuno assay.
C705.5	To elaborate various principles, theory and instruments employed for the characterization and analysis of drugs.
C705.6	To maximize knowledge of electron resonance spectroscopy, NMR and X-Ray diffraction techniques and electrochemical techniques.

Course Name : Pharmaceutical Analysis – II (Practical);	
Course code : 706	
Year of Study : 2017-2018, IV.B.Pharmacy, Seventh Semester.	
C706.1	To relate the importance of absorption maximum, electromotive force, dissociation constant and efficient compound separation for organic compounds.
C706.2	To understand the different principles involved in the qualification/quantification of pharmaceutical compounds by using different volumetric and instrumental methods.
C706.3	To experiment selected drugs by UV, Visible spectroscopy / electrochemical and chromatographical techniques.
C706.4	To analyze/characterize active pharmaceutical ingredient/ excipients using advanced analytical techniques.
C706.5	To estimate the amount of moisture content by KF titrimetry and hardness of water by complexometry.
C706.6	To estimate the amount of sodium and potassium ions by flame photometry.
Course Name : Industrial Management and Pharmaceutical Marketing (Theory)	
Course code : 707,	
Year of Study : 2017-2018, IV.B.Pharmacy, Seventh Semester.	
C707.1	To choose different elements of organization and management in pharmaceutical industry.
C707.2	To illustrate plant location, layout of pharmaceutical industry and distinguish between product layout versus process layout.
C707.3	To develop different types of management techniques to solve management related problems.
C707.4	To elaborate the outcomes of management and provide information to the end users.
C707.5	To justify optimum utilization of resources in pharmaceutical industry.
C707.6	To maximize outputs with minimum inputs in pharmaceutical organization.

Course Name : Project;	
Course code : 708	
Year of Study : 2017-2018, IV.B.Pharmacy, Seventh Semester.	
C708.1	To recall and identify the societal issues related to health and pharmaceuticals and to report the aims and objectives of the project.
C708.2	To review and compare the literature on selected topic / problem / issue.
C708.3	To design a plan of work and execute it accordingly.
C708.4	To analyze and compile the results of the project.
C708.5	To justify the objectives and summarize the reports.
C708.6	To publish a paper or patent with acceptable limit of (<30%) plagiarism.
Course Name : Pharmaceutical Chemistry – V [Natural Products] (Theory)	
Course code : 801,	
Year of Study : 2017-2018, IV.B.Pharmacy, Eight Semester.	
C801.1	To remember different categories of natural products.
C801.2	To gain knowledge of natural product applications for good health.
C801.3	To apply the knowledge of isolation of natural products.
C801.4	To discuss the chemistry, interrelationship and synthesis of various classes of natural products.
C801.5	To assess the quality of natural products by various qualitative and quantitative tests.
C801.6	To elaborate the stability, purity and quality of various classes of natural products.

Course Name : Pharmaceutical Chemistry – V [Natural Products] (Practical)	
Course code : 802	
Year of Study : 2017-2018, B.Pharmacy, Eight Semester.	
C802.1	To recall various qualitative and quantitative tests to check the quality of natural products and to learn how to isolate natural products.
C802.2	To gain knowledge on chemical reactions or chemistry involved in various qualitative and quantitative procedures or tests.
C802.3	To experiment with practice of isolation and characterization of natural products from plant materials.
C802.4	To analyze the quality of natural products by qualitative and quantitative analysis.
C802.5	To analyze fats and oils by pharmacopoeial methods.
Course Name : Pharmacognosy – II (Theory);	
Course code : 803	
Year of Study : 2017-2018, B.Pharmacy, Eighth Semester.	
C803.1	To remember and understand the selected crude drugs.
C803.2	To outline the systematic pharmacognostic study of various crude drugs such as glycosides, alkaloids, volatile oils, lipids etc.,
C803.3	To understand chemical constituents and uses of crude drugs.
C803.4	To create a strategic approach towards ayurvedic drugs.
C803.5	To develop the skills and knowledge of tissue culture in the production of pharmaceuticals.
C803.6	To improve the orientation of the students by giving broad spectrum of knowledge on secondary metabolites.

Course Name : Pharmacognosy – II (Practical); Course code : 804 Year of Study : 2017-2018, B.Pharmacy, Eighth Semester.	
C804.1	To gain knowledge in study of crude drug from large scale and small scale processing, collection, preservation and storage of crude drugs.
C804.2	To remember the wide variety of the crude drugs and their sources by morphological characteristics.
C804.3	To understand the morphological and microscopical features of selected crude drugs.
C804.4	To analyze and evaluate the powdered crude drug samples by morphological and microscopical characteristics.
C804.5	To evaluate the powder mixture and to report the types of adulterants and substituents present.
C804.6	To create and evaluate profitable tissue and seeds for germination by using tissue culture.
Course Name : Good Manufacturing Practice and Validation (Theory); Course code : 805 Year of Study : 2017-2018, B.Pharmacy, Eighth Semester.	
C805.1	To recall the concepts of GMP, validation, calibration and ICH guideline along with computer applications.
C805.2	To explain the validation and calibration methods for analytical instruments and to understand the concepts of sampling techniques for different types of analytical data.
C805.3	To make use of the ICH guidelines for harmonized good laboratory practices and to perform the calibration and qualification for analytical instruments according to regulatory guidelines.
C805.4	To find out the variations in good manufacturing practices while comparing the different types of international regulatory guidelines and to know about ISO 9000 series.
C805.5	To compare and conclude the analytical raw data with the help of statistical techniques and quality control charts.
C805.6	To design and adapt the SOPs and protocols for validation of method development and for validation of analytical equipment.

RULES & REGULATIONS FOR PREVENTION AND PROHIBITION OF RAGGING

The All India Council for Technical Education (AICTE), New Delhi vide its Notification No. 37-3/Legal/AICTE/2009, dated 25/03/2009 has taken a very serious view of ragging incidences in educational institutions and on Directions of the Hon'ble Supreme Court of India vide its Order dated 16/05/2007 has ordered strict implementation of following rules and regulations for Prevention and prohibition of Ragging in technical Institutions.

Various Types of Ragging:

The Hon'ble Supreme Court has, inter-alia, mentioned the following types of Ragging:

01. Ragging has several aspects with, among others, psychological, social, political, economic, cultural and academic dimensions.
02. Any act that prevents, disrupts or disturbs the regular academic activity of a student should be considered with in the academics related aspect of ragging; similarly, exploiting the services of a junior student for completing the academic tasks assigned to an individual or a group of seniors is also an aspect of academics related ragging prevalent in many institutions, particularly in the technical institutions.
03. Any act of financial extortion or forceful expenditure burden put on a junior student by senior students should be considered an aspect of ragging for ragging economic dimensions.
04. Any act of physical abuse including all variants of it; sexual abuse, homosexual assaults, stripping, forcing obscene and lewd acts, gestured, causing bodily harm or any other danger to health or person can be put in the category of ragging with criminal dimensions.
05. Any act or abuse by spoken words, emails, snail-mails, blogs, public insults should be considered with in the psychological aspects of ragging. This aspect would also include deriving perverted pleasure, vicarious or sadistic thrill from actively or passively participating in the discomfiture to others; the absence of preparing 'freshers' in the run up to their admission to higher education and life in hostels also can be ascribed as a psychological aspect of ragging - coping skills in interaction with seniors or strangers can be imparted by parents as well. Any act that affects the mental health and self-confidence of students also can be described in terms of the psychological aspects of ragging.

06. The human rights perspective of ragging involves the injury caused to the fundamental right to human dignity through humiliation heaped on junior students by seniors; often resulting in the extreme step of suicide by the victims.

Actions to be taken against students for indulging and abetting in Ragging in technical institutions Universities including Deemed to be University imparting technical education:

01. The punishment to be meted out to the persons indulged in ragging has to be exemplary and justifiably harsh to act as a deterrent against recurrence of such incidents. The students who are found to be indulged in ragging should be debarred from taking admission in any technical institution in India.
02. Every single incident of ragging a First Information Report (FIR) must be filed without exception by the institutional authorities with the local police authorities.
03. Depending upon the nature and gravity of the offence as established by the Anti-Ragging Committee of the institution, the possible punishments for those found guilty of ragging at the institution level shall be any one or any combination of the following:
- i) Cancellation of admission
 - ii) Suspension from attending classes
 - iii) Withholding/withdrawing scholarship/fellowship and other benefits
 - iv) Debarring from appearing in any test / examination or other evaluation process.
 - v) Withholding results.
 - vi) Debarring from representing the institution in any regional, national or international meet, tournament, youth festival etc.
 - vii) Suspension/expulsion from the hostel.
 - viii) Rustication from the institution for period ranging from 1 to 4 semesters.
 - ix) Expulsion from the institution and consequent debarring from admission to any other institution.
 - x) Fine of Rupees 25,000/-
 - xi) **Collective punishment:** when the persons committing or abetting the crime of ragging are not identified, the institution shall resort to collective punishment as a deterrent to ensure community pressure on the potential raggars.

04. The institutional authority shall intimate the incidents of ragging occurred in their premises along with actions taken to the Council immediately after occurrence of such incident and inform the status of the case from time to time.
05. Courts should make an effort to ensure that cases involving ragging are taken up on priority basis to send the correct message that ragging is not only to be discouraged but also to be dealt with sternness.

SETTING UP OF ANTI-RAGGING COMMITTEE, ANTI-RAGGING SQUAD AND THEIR FUNCTIONS

The Anti-Ragging Committee:

The anti-ragging committee shall be headed by the Head of the Institution and shall consist of representatives of Civil & Police administration, local media, non-government organizations involved in youth activities, faculty members, parents, students belonging to the freshers category as well as seniors and non-teaching staff. It shall monitor the Anti Ragging activities in the institution, consider the recommendations of the Anti-Ragging Squad and take appropriate decisions, including spelling out suitable punishments to those found guilty.

The Anti-Ragging Squad:

The Anti-Ragging Squad shall be nominated by the Head of the Institution with such representation as considered necessary and shall exclusively consists of members belonging to the various sections of the campus community. The squad shall have vigil, oversight and patrolling functions. It shall be kept mobile, alert and active at all times and shall be empowered to inspect places of potential ragging and make surprise raids on hostels and other hot spots. The squad shall investigate incidents of ragging and make recommendations to the Anti-Ragging Committee and shall work under the overall guidance of the Anti-Ragging Committee.

A.N.U. B.PHARMACY SYLLABUS (WITH EFFECT FROM 2012 - 13 ACADEMIC YEAR)

SCHEME OF INSTRUCTION AND EXAMINATION UNDER SEMESTER PATTERN

Course No.	SUBJECT	Periods per week		Exam. Duration (hrs)	Marks		TOTAL
		Theory	Practical		Sessional	Semester end	
I/IV B.PHARMACY 1st and 2nd SEMESTERS							
101A	Mathematics (Bridge Course) (Theory)	4	---	3	30	70	100
101B	Biology (Bridge Course) (Theory)	2	----	3	30	70	100
101C	Biology (Bridge Course) (Practicals)	---	3	3	30	70	100
102	Pharmaceutical Chemistry-I (Organic-I) (Theory)	3	---	3	30	70	100
103	Pharmaceutical Chemistry-I (Practicals)	---	3	4	30	70	100
104	Physical Pharmacy-I (Theory)	3	---	3	30	70	100
105	Physical Pharmacy-I (Practicals)	---	3	4	30	70	100
106	Computer Applications and Statistical Methods.(Theory)	3		3	30	70	100
201	Pharmaceutics - I (General Pharmacy) including Dispensing (Theory)	3	---	3	30	70	100
202	Pharmaceutics - I (General Pharmacy) Practical	---	3	4	30	70	100
203	Pharmaceutical Analysis-I (Theory)	3	---	3	30	70	100
204	Pharmaceutical Analysis-I (Practicals)	---	3	4	30	70	100
205	Environmental Studies (Theory)	2	---	3	30	70	100
Total :		23	15	43	390	910	1300

**M.P.C. STUDENTS : 1200
Bi.P.C. STUDENTS : 1100**

:: 44 ::

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

101 A MATHEMATICS (75 hrs.)

Unit : 01

ALGEBRA: Arithmetic progression-Geometric Progression-Permutations and Combinations-Binomial theorem-Partial functions-Matrices- Determinants- Application of determinants to solve simultaneous equations (Cramer's Rule)

Unit : 02

CO- ORDINATE GEOMETRY: Distances between two points – Area of a Triangle, Co-ordinates of a point dividing a given segment in a given ratio-locus-equation to a straight line in different forms –Angle between straight lines –Point of intersection.

Unit : 03

DIFFERENTIAL CALCULUS:

Limit of a function, derivative of a function, Differentiation of a sum, Product and quotient, Differentiation of composite functions, Implicit functions, parametric functions, Logarithmic differentiation, differentiation of exponentials.

Unit : 04

CONTINUITY AND LIMIT: Differentiation, derivability and derivative, R.H. derivatives and L.H. derivatives, differentiations. General theorems of derivation. Derivatives of trigonometric functions (excluding inverse trigonometric and hyperbolic functions). Logarithmic differentiation. Partial differentiation maxima and minima (elementary)

Unit : 05

INTEGRAL CALCULUS: Integration as inverse process of differentiation, definite integrate integration by substitution, integration by parts, integration of Algebraic function of evaluation of area in simple cases.

Unit : 06

DIFFERENTIAL EQUATIONS: Formation of differential equation, order and degree, derivation of a differential equation.Introduction to Laplace transforms and their use.

TEXT BOOKS

- | | | |
|--|---|--|
| 1. Differential Calculus | : | Shantinarayan |
| 2. Integral Calculus | : | Shantinarayan |
| 3. Engineering Mathematics | : | Grewaf |
| 4. Intermediate Mathematics | : | V.Venkateswara Rao
N.Krishnamurthy
B.V.S.S.Sarma |
| 5. Differential Equations and their applications | : | Jafar Ahsan |

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

MODEL QUESTION PAPER
101 A MATHEMATICS

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions

(4 X 10 = 40 marks)

1. If
$$\begin{vmatrix} (a+b)^2 & ca & bc \\ ca & (b+c)^2 & ab \\ bc & ab & (c+a)^2 \end{vmatrix} = k abc (a + b + c)^3$$
 then find the value of K.

- 2.a. Find the equation of the straight line passing through the point of intersection of the lines $x + y + 1 = 0$, $2x - y + 5 = 0$ and through the point (5, -2)
- b. Show that the points (1, 2) (-3, 4) (7, -1) are collinear.
3. If $x = a(1 + \sin\theta)$, $y = b(\theta - \cos\theta)$, then find (dy/dx) at $\theta = \pi/4$
4. Suppose that $f(x) = (1 - \cos ax)/(x \sin x)$, $x \neq 0$ and $f(0) = 1/2$
If f is continuous at $x = 0$, show that $a = \pm 1$

5.a. Evaluate $\int_0^{\pi/2} dx/(4+5\cos x)$

b) Evaluate $\int_0^{\pi} \sin x \sin 2x \sin 3x dx$

6. Solve : $3e^x \cos^2 y dx + (1 - e^x) \cot y dy = 0$

SECTION - B

Answer any TEN questions

(10 x 3 = 30 MARKS)

1. Find the sum to 'n' terms of the series $4 + 44 + 444 + \dots$
2. Resolve into partial fractions $1/(x(x^2+1))$
3. Find the area of triangle with vertices are (-1, 6), (-3, 9), (1, -3)
4. Find the locus of the point P such that $PA : PB = 3 : 1$ with $A = (4, 2)$ and $B = (-1, 5)$
5. Find the derivative of $\frac{\sin x + \cos x}{\sqrt{1 + \sin 2x}}$
6. Find (dy/dx) if $y = x^x$
7. Find $\lim_{x \rightarrow \alpha} \frac{7x^3 - 8x^2 + 3}{2x^3 + 10x^2 - 20}$
8. Find $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} + x^2 - 1}{x}$
9. Evaluate $\int \cos^7 x dx$
10. Find the area bounded by the curves $y^2 = x$ and the line $x = 4$
11. Solve $(dy/dx) + \frac{\sqrt{1+y^2}}{\sqrt{1+x^2}} = 0$
12. Find the Laplace transform of $f(t) = \sin 2t \sin 3t$

:: 46 ::

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

101 B BIOLOGY (Theory) (50 hrs.)

Unit : 01

Living and non-living organisms and their differences, Plants and animals differences; Cell structure, Cell inclusions. Mitosis in animals and Meiosis in animals.

Unit : 02

Classification of plant kingdom and salient features of different groups only. Structure and life history of Bacteria and Yeast.

Unit : 03

Taxonomic Families : Solanaceae and Umbelliferae.

Unit : 04

Root (taproot and fibrous roots and their functions only), Stem, Leaf (Vegetative morphology), Flower, Inflorescence (Reproductive morphology), Anatomical structures of root, stem (Monocot and Dicot), Root and Fruit (Types of fruit); seed formation; pollination (different types of pollinating agents) and types of pollination methods.

Unit : 05

Classification of animal Kingdom; Invertebrates, vertebrates and their salient features only. Structure and physiology of Amoeba, Paramecium and Earthworm (locomotion, digestive, excretory and reproductive systems only).

Unit : 06

Parasitology: Introduction, Entamoeba, Plasmodium, Trypanosoma and Ascaris (Structure and Life history only).

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

101 C BIOLOGY (Practicals) (50 hrs.)

01. Care and use of the Microscope
02. Technical description of plants belonging to the Angiosperms families prescribed in the syllabus and referring them to their respective families.
03. Microscopic study of different tissues and the primary anatomical structure of a root, stem and leaf.(Monocot & Dicot)
04. Microscopic and macroscopic examination and identification of the types prescribed in the syllabus.
- 05*. Dissection in Earthworm, (Digestive & Nervous systems)

TEXT BOOKS

1. A class book of Botany : A.C.Dutta
2. Outlines of Zoology : Ekkambarnath Iyer
3. A text book of Vertebrate Zoology : S.N.Prasad
4. A text book of invertebrates : N.C.Nair
5. Intermediate Academy text books of Botany & Zoology

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

MODEL QUESTION PAPER

101B BIOLOGY (Theory)

Time : 3 hours

Max.Marks : 70

SECTION-A

Answer any four questions (10 X 4 = 40 marks)

01. Explain in detail about Meiosis
02. Give a brief account of classification and salient features of various groups of plants.
03. Write the characteristic features and medicinal importance of plants belonging to the family solanaceae.
04. Describe the Morphological and anatomical character of dicot root.
05. Explain the structure and physiology of paramoecium.
06. Write in detail the structure and life history of malarial parasite.

SECTION - B

Answer any TEN questions (10 X 3 = 40 Marks)

07. List out the differences between plants and animals.
08. Write a note on plastids
09. Write the salient features of Angiosperms
10. Explain the reproduction in Bacteria.
11. Discuss the economic and medicinal importance of plants belonging to the family solanaceae.
12. Describe the floral characters of umbelliferae with necessary diagrams and floral formula.
13. Write about racemose type of inflorescence.
14. Explain the fertilisation in plants.
15. Write about salient features of vertebrates.
16. Discuss the reproduction in Amoeba
17. Write about Muscular tissues of animals.
18. Write in brief about the life history of Trypanosoma.

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

MODEL QUESTION PAPER

101C BIOLOGY (Practicals)

Time : 4 hours

Max.Marks : 70

1. Synopsis : 10 Marks
- 2* Major Experiment : 30 Marks
3. Minor Experiment : 20 Marks
4. Viva-Voce : 10 Marks

Total: 70 Marks

I/IV B.PHARMACY (1st & 2nd SEMESTERS)
102 PHARMACEUTICAL CHEMISTRY-I (ORGANIC-I)
(Theory) (75 hrs.)

Unit : 01

Structure and Properties :

- Characteristic features of covalent bond, hydrogen bond, intermolecular forces, hybridisation.
- Reactive intermediates : Free radicals, carbocations and carbanions
- Electron displacement effects : Inductive effect, electromeric effect, resonance and hyperconjugation effects.
- Attacking reagents : Electrophiles and nucleophiles.

Unit : 02

Chemistry of Hydrocarbons :

- Nomenclature and general methods to prepare alkanes, alkenes, alkynes and cycloalkanes.
- Free radical chain reactions of alkanes - mechanism, relative reactivity and stability.
- Electrophilic addition : Reactions at carbon-carbon double bond, hydrogenation, Markovnikov's rule, addition of hydrogen halides, addition of hydrogen bromide, peroxide effect, electrophilic addition mechanism, cycloaddition, ozonolysis reactions, addition of carbenes to alkenes and glycol formation reaction.
- Addition of hydrogen halides and water to alkynes, polymerisation reaction and acidity of alkynes.
- Bayer's strain theory of strainless rings.
- Stability of conjugated dienes, mechanism of 1, 2 and 1, 4-additions with examples, effect of temperature on 1, 2 and 1, 4- addition to dienes.

Unit : 03

Chemistry of Alcohols and Ethers

- Nomenclature and general methods to prepare monohydric alcohols and ethers.
- Classification and isomerism in alcohols and ethers.
- Oxidation of alcohols, reaction of alcohols with metals and phosphorous trihalides and chemical tests to distinguish alcohols, dehydration of alcohols and its mechanism, orientation and reactivity in E2 and E1. reactions, Saytzeff's and Hoffmann's elimination.
- Brief account of absolute alcohol and Rectified spirit.
- Cleavage of ethers by acids, mechanism of Williamson's synthesis.

Unit : 04

Chemistry of alkyl halides :

- a. Nomenclature and general methods to prepare alkyl halides.
- b. Nucleophilic aliphatic substitution : Mechanism and stereochemistry of SN1 and SN2 reactions, SN2 vs SN1 reactions, reactivity of alkyl halides in SN1 and SN2 reactions and factors affecting SN1 and SN2 reaction.

Unit : 05

Chemistry of Carbonyl compounds :

- a. Classification, nomenclature and general methods to prepare carbonyl compounds
- b. Nucleophilic addition in aldehydes and ketones, mechanism with examples (addition of sodium bisulphite, hydrogen cyanide, alcohols, Grignard reagent and ammonia derivatives), Mechanism of Aldol condensation, crossed aldol condensation, cannizaro's reaction, reformatsky reaction, perkin reaction and Benzoin condensation.

Unit : 06

Chemistry of carboxylic acids and acid derivatives :

- a. Nomenclature and general methods to prepare carboxylic acids, acid chlorides, acid amides and esters.
- b. Nucleophilic acyl substitution in carboxylic acid derivatives, comparison with nucleophilic addition reaction, acidity of carboxylic acids, effect of substituents on acidity, HVZ reaction, conversion of acids to acid chlorides, amides, esters and anhydrides, acidic and alkaline hydrolysis of esters, esterification and Claisen condensation reactions.
- c. Preparation and synthetic uses of acetoacetic and malonic esters.

I/IV B.PHARMACY (1st & 2nd SEMESTERS)
103 PHARMACEUTICAL CHEMISTRY - II (ORGANIC-I)
(Practicals) (75 hrs.)

01. Determination of melting point.
02. Determination of boiling point.
03. Demonstration of various filtration techniques.
04. Demonstration of various crystallisation techniques
05. Synthesis of benzoic acid by hydrolysis of Benzamide.
06. Synthesis of dibromo cinnamic acid from cinnamic acid.
07. Synthesis of dibenzal acetone from benzaldehyde
- 08*. Identification of organic compounds pertaining to phenols, amides, amines, carboxylic acids, aldehydes and ketones, alcohols, esters, hydrocarbons, nitro compounds and ethers by systematic qualitative organic analysis including preparation of derivatives.

TEXT-BOOKS :

01. R.T.Morrison and R.N.Boyd. 'Organic Chemistry'. Allyn and Bacon, In., Boston.
02. I.L.Finar, 'Organic Chemistry', Vol.1, the English Language Book Society, London.
03. B.S.Furniss, A.J.Hannaford, V.Rogers, P.W.G.Smith and A.H.Tatchell, Vogel's Text Book of Practical Organic Chemistry (Including qualitative organic analysis). The English Language Book Society.
04. Study guide to accompany the T.B. of organic chemistry by Morrison and Boyd-Morrison and Boyd.5
05. Problems and their solution in Organic Chemistry - I.L.Finar.
06. Rama Rao Nadendla, Principles of Pharmaceutical Organic Chemistry, MacMillan India Ltd., New Delhi.

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

MODEL QUESTION PAPER

102 PHARMACEUTICAL CHEMISTRY-I (ORGANIC-I) (Theory)

Time : 3 hours

Max.Marks : 70

SECTION-A

Answer any four questions (4 X 10 = 40 marks)

1. What are carbocations ? Classify carbocations with examples ? Explain relative of formation and stability of Carbocations ?
2. What are cycloalkanes ? Write any three methods of their preparation and reactions.
3. Discuss the important methods to prepare monohydric alcohols.
4. Discuss the mechanism of SN reaction with a suitable example and support the same with evidence.
5. What are carbonyl compounds and how are they prepared ? Discuss the important nucleophilic reactions which they undergo
6. Discuss any three methods for the preparation of carboxylic acids ? Explain the effect of substituent groups on the acidity of carboxylic acids.

SECTION - B

Answer any TEN questions (10 X 3 = 30 Marks)

7. Justify the statement - "Tertiary carbocation is more stable than methyl carbocation"
8. Write short notes on Resonance.
9. Explain 1, 2 and 1, 4- addition of Bromine to 1, 3-Butadiene
10. Write Markonikov's rule and anti-Markonikov's rule. Explain with suitable examples ?
11. How will you distinguish primary, secondary and tertiary alcohols ?
12. Write short notes on Hoffmann's elimination.
13. Describe any two methods for the preparation of alkyl halides ?
14. Why primary alkyl halides undergo only SN2 reaction ?
15. Give reason for the statement. "Benzaldehyde undergoes Cannizzaro reaction but not aldol condensation"
16. Write short notes on Perkin reaction ?
17. Acid chlorides are more reactive than simple carboxylic acids. Explain why.
18. Write short notes on HVZ reaction.

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

102 PHARMACEUTICAL CHEMISTRY-I (ORGANIC-I)

MODEL QUESTION PAPER (Practicals)

Time : 4 hours

Max.Marks : 70

- | | | |
|----------------------|---|----------|
| 1. Synopsis | : | 10 Marks |
| 2*. Major Experiment | : | 30 Marks |
| 3. Minor Experiment | : | 20 Marks |
| 4. Viva-Voce | : | 10 Marks |

Total: 70 Marks

I/IV B.PHARMACY (1st & 2nd SEMESTERS)
104 PHYSICAL PHARMACY-I (Theory) (75 hrs.)

Unit : 01

Intermolecular forces and states of matter : Binding forces between molecules,

States of matter : Gaseous state , liquid state, solid state and crystalline state, phase equilibria and the phase rule.

Unit : 02

Thermodynamics : The first law of thermodynamics, thermo- chemistry, the second law of thermodynamics, the third law of thermodynamics, free energy functions and applications.

Unit : 03

Some physical properties of drug molecules: Dielectric constant, induced polarization, dipole moment, refractive index and molar refraction, optical rotation and optical dispersion.

Unit : 04

Solutions : Concentration expressions, solutions of nonelectrolytes, ideal and real solutions, colligative properties, molecular weight determinations.

Solutions of Electrolytes : Properties of solutions of electrolytes, the arrhenius theory of electrolytic dissociation, the modern theory of strong electrolytes and other coefficients for expressing colligative properties.

Unit : 05

Ionic Equilibria : Modern theories of acids, bases and salts, Sorensen's p^H scale, species concentration as a function of p^H , calculation of p^H , graphical solution of p^H problems, acidity constants .

Buffers and Buffered Isotonic systems : The buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions, methods of adjusting tonicity and p^H .

Unit : 06

Electromotive Forces and Oxidation-Reduction systems : Electro-chemical cells, electro metric determination of p^H and redox potentials.

Viscosity :Viscosity, poisseullis formula for liquids, experimental determination of viscosity, ostwald viscometer, comparison of viscosities.

Photochemistry : Consequences of light absorption, jablenski diagram, lambert-Beer law and quantum efficiency.

I/IV B.PHARMACY (1st & 2nd SEMESTERS)
105 PHYSICAL PHARMACY - I (Practicals) (75 hrs.)

01. Determination of solubility of Salicylic acid
02. Determination of viscosity of given liquid.
- *03. Effect of temperature on viscosity
04. Determination of density of given solid
- *05. Determination of upper consolute temperature of phenol-water system
- *06. Effect of sodiumchloride on CST of phenol-water system.
07. Determination of surface tension.
08. Determination of interfacial tension.
09. Determination of dielectric constant and its relationship to solubility
10. Determination of optical activity.
11. Determination of pK_a of salicylic acid
12. Preparation of acetate buffer of pH 4
- *13. Determination of pK_a of acetic acid by graphical method.
14. Determination of Buffer capacity.

Text Books :

01. Physical Pharmacy by Alfred Martin
02. Bentley's Text book of Pharmaceutics by E.A.Rawlins.
03. Remington's Pharmaceutical Sciences.

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

MODEL QUESTION PAPER

104 PHYSICAL PHARMACY - I (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

01. With the help of a neat labelled diagram explain the phase diagram of phenol-water system. How is the tie line useful in calculating the composition of the conjugate layers.
02. State and explain first law of thermodynamics. How does the equation take different forms under different thermodynamic situations.
03. What are colligative properties. Derive an expression for calculation of molecular weight of non-volatile solute by freezing point depression method.
04. Explain the Arrhenius theory of electrolytic dissociation. Give its limitations.
05. What are iso osmotic, isotonic, hypertonic and hypotonic solutions. Discuss the various methods available for adjustment of tonicity of solutions.
06. With a neat labelled diagram explain the construction and working of Daniel cell. What is the role of the salt bridge and how does it prevent accumulation of charges at the electrodes.

SECTION - B

Answer any TEN questions (10 X 3 = 30 marks)

07. What is polymorphism. Give its applications in pharmacy.
08. Write short notes on hydrogen bonding.
09. Distinguish between reversible and irreversible process.
10. What is entropy. How do you predict the spontaneity of a process using the concept of entropy.
11. Differentiate between ideal and real solution using suitable examples.
12. A sample of camphor used in the camphor rasi method had a melting point of 176.5°C. The melting point of a solid solution containing 0.522 g of camphor and 0.0386 g of drug was 160°C. Find the molecular weight of unknown drug substance. K_f of camphor is 37.7°C kg/mole.
13. State and explain Faraday's second law of electrolysis.
14. Write short notes on Vant Hoff factor for calculation of colligative properties of electrolyte solutions.
15. What is PBE equation. Give the rules for writing a proton balance equation.
16. Discuss the importance of buffers in pharmaceutical and biological systems.
17. Explain the principle involved in determination of viscosity of a liquid by Ostwald's viscometer.
18. Write short notes on Beer Lambert's law and its application in pharmacy

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

104 PHYSICAL PHARMACY - I

MODEL QUESTION PAPER (Practicals)

Time : 4 hours

Max.Marks : 70

- | | | |
|----------------------|---|----------|
| 1. Synopsis | : | 10 Marks |
| 2*. Major Experiment | : | 30 Marks |
| 3. Minor Experiment | : | 20 Marks |
| 4. Viva-Voce | : | 10 Marks |

Total: 70 Marks

:: 55 ::

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

106 COMPUTER APPLICATIONS AND STATISTICAL METHODS

(Theory) (75 hrs.)

Unit : 01

Introduction to computers development, computer types, characteristics, anatomy – input and output devices and other components – computer codes and arithmetic, flow chart, algorithm, languages.

BASIC Language : BASIC Program structure, constants, variables, expressions, LET, REM, STOP and END statements, input / output statements, control statements, additional statements, simple programme writing related to statistics.

Unit : 02

Introduction to DOS environment DOS usage

Fundamentals of BASIC Language: BASIC programmes, structure, loading and unloading, Basic Interpreter, Basic alphabet, constants, variables, operators, Expressions, hierarchy of operations.

Branching and Looping : IF-THEN, ELSE-GOTO, ON GOTO, GOSUB, ON GOSUB, WHILE – WEND, FOR-NEXT.

Arrays : Subscripted variable, single and multiple dimensions.

Graphs and sound : LINE, CIRCLE, DRAW, PSET, POINT, PAINT, PUT, GET, SOUND, PLAY etc.

Unit : 03

Introduction to C language : Development of C, Features, constants and variables, data types, operators and expressions, library functions,

I/O statements : Formatted and unformatted I/O, Scanf(), Printf(), getchar() and putchar() function.

Control structures : conditional and unconditional, IF, FOR, WHILE, SWITCH, BREAK and CONTINUE, GOTO statement. Application of Computers in Pharmacy

Unit : 04

Introduction to statistics, chance variations, collection, classification, graphical and pictorial representation of data, measures of central tendency and dispersion. Precision and Accuracy- Measures of Error.

Unit : 05

Probability, Normal and Binomial distributions, sampling distributions - standard error and Fiducial limits. t-test, chi-square test, F-test of significance - Principle involved and applications, analysis of variance (ANOVA).

Unit : 06

Correlation coefficient and Regression analysis – Method of least squares.

TEXT BOOKS :

01. Remington's Pharmaceutical Sciences.
02. Basic Computer Programming by Er.V.K.Jain
03. Biostatistics by Alwin L.Lewis
04. Computers and common sense - N.Hunt and J.Shelley.
05. Programming in "C" by E.Balaguru Swami.

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

MODEL QUESTION PAPER

106 COMPUTER APPLICATIONS AND STATISTICAL METHODS

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. Explain the improvements made to computer systems in different generations.
2. Give the syntax and utility of the following statements in BASIC
 1. CIRCLE
 2. READ-DATA
 3. FOR-NEXT
 4. LOAD
3. Explain the control structures in "C" language
4. Explain in detail about the MEASURES OF CONTRAL TENDENCY with necessary formulae.
5. Define probability. Write properties and importance of Normal, Binomial distribution.
6. What is meant by correlation ?
What are positive and negative correlations ?
How coefficient of correlation obtained.

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. Explain the different sub units of a C.P.U
8. Write a program in BASIC to print the squares of first ten natural numbers.
9. Explain the use of the following MSDOS commands.
 - a. TREE
 - b. COPY CON
 - c. PROMPT
 - d. MD
10. Write about the arithmetic and their hierarchy. What are relational and logical operators ?
11. Write any four applications of computers in PHARMACY.
12. Explain Input statements of "C" language with examples.
13. Explain pictorial representation of data.
14. Define an error ? Write notes on different types of errors.
15. Define and explain chi-square distribution.
16. Define probability, random experiment and sample space.
17. Define regression. Give the two regression equations.
18. Explain Method of least squares and fit a straight line of the form $Y = a + bx$.

I/IV B.PHARMACY (1st & 2nd SEMESTERS)
201 PHARMACEUTICS - I (Theory) (75 hrs)

UNIT : 01

History of Pharmacy : Pharmacy Profession, Pharmacy as a career, Evolution of Pharmacy - Pharmacopoeia of India and other countries, B.P., B.P.C., U.S.P.

Metrology : Systems of Weights and Measures - Metric and Imperial systems - Percentage calculations and adjustment of products - **Interconversions** - Use of alligation method in calculations - Isotonic solutions and proof spirits.

Packaging and Labelling of Pharmaceuticals : Desirable features of a container - Types of containers - Study of glass and plastics as materials for containers and rubber as a material for closures - their merits and demerits - Labelling requirements.

UNIT: 02

Introduction to Dosage Forms: Classification - Types with examples, Definitions and essential characteristics of different dosage forms - Formulation and its purpose - Formulation

Additives : Solvents, Vehicles for Liquids, Antioxidants, Preservatives, Colouring agents, Sweetening and flavouring agents in Liquid dosage forms.

UNIT:03

Liquid oral dosage forms : Definitions, General formulation, methods of preparation, uses of official and other products in common usage of the following : Solutions, Aromatic Waters, Spirits, Syrups, Elixirs, Dry Syrups, Mixtures.

UNIT:04

Monophasic Liquids for external and other uses: Definitions, general formulation, methods of preparation, uses of official and other products in common usage of the following: Lotions, Liniments, throat paints, gargles, mouthwashes, glycerins, collodions, Ear drops, Nasal drops and Sprays, Douches.

Biphasic liquid dosage Forms : Suspensions and Emulsions - Definitions, Types, Ideal requirements, Formulation additives, Typical examples for oral and external use, Methods of preparation.

UNIT:05

Galenicals: Study of extraction processes – Maceration Percolation and their modifications, continuous hot extraction - Their applications. Principles and methods of preparations of dry, soft and liquid extracts and tinctures of I.P and B.P (Latest editions).

UNIT:06

Powders: Definition, Classification of Powders, Preparation of different types of Powders, Packing of Powders. Brief introduction on Cachets'.

Suppositories and Pessaries: Ideal requirements, different bases, Preparation methods - Typical examples, calculations involving displacement value - Packaging and supply.

I/IV B.PHARMACY (1st & 2nd SEMESTERS)
202 PHARMACEUTICS-I (General Pharmacy)
(Practicals) (75 hrs.)

Preparation of the following classes of dosage forms.

AROMATIC WATERS

01. Chloroform water I.P.
02. Cinnamon water
03. Camphor water
04. Peppermint water

SOLUTIONS

05. Aqueous iodine solution (Lugol's solution)
06. Strong iodine solution I.P. (Strong tincture of iodine)
07. Weak iodine solution I.P. (Tincture of iodine)
08. Strong ammonium acetate solution.
- 09*. Surgical solution of chlorinated soda (Dakin's solution)
- 10*. Cresol with soap solution I.P. (Lysol solution)

SYRUPS

11. Syrup
12. Citric acid syrup USP
13. Codeine phosphate syrup
- 14*. Compound ferrous phosphate syrup

ELIXIRS

15. Compound benzaldehyde elixir
16. Terpin hydrate elixir

LOTIONS

17. Copper and zinc Sulphate lotion BPC
18. Sodium thiosulphate lotion
- 19*. Calamine lotion
20. Benzyl benzoate lotion
21. Lime cream (Oily calamine lotion)

LINIMENTS

22. Camphor liniment (Camphorated oil)
23. Turpentine liniment

GARGLES

24. Phenol gargle BPC

MOUTH WASHES

25. Phenol and alkali mouth wash
26. Compound sodium chloride mouth wash

THROAT PAINTS

27. Compound iodine paint (Mandl's throat paint)

DOUCHES

28. Solution of alum (Vaginal douche)
29. Potassium permanganate solution BPC

:: 60 ::

EAR DROPS

31. Hydrogen peroxide ear drops BPC
32. Sodium bicarbonate ear drops
33. Phenol ear drops

NASAL DROPS

34. Ephedrine hydrochloride nasal drops.

GLYCERITES

35. Phenol glycerin
36. Borax glycerin
37. Starch glycerin
38. Tannic acid glycerin

SUSPENSIONS

39. Magnesium carbonate suspension BPC
40. Magnesium trisilicate suspension BPC
41. Paediatric chalk mixture
- 42*. Magnesium hydroxide suspension IP (Milk of magnesia)
- 43*. Liquid paraffin emulsion
- 44*. Calciferol emulsion
- 45*. Castor oil emulsion
46. Castor oil enema (Emulsion)

SUPPOSITORIES :

- 47*. Glycero-gelatin suppositories
48. Crystal violet pessaries

TEXT BOOKS :

01. Bentley's Text book of Pharmaceutics.
02. Introduction to Pharmaceutical Dosage Forms by H.C.Ansel
03. Cooper and Gunn's – Dispensing for Pharmaceutical Students
04. American Pharmacy by Sprowls
05. I.P. 3rd Edition
06. Remington's Pharmaceutical Sciences.
07. General Pharmacy and Professional Pharmacy by M.L.Schroff.

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

MODEL QUESTION PAPER

201 PHARMACEUTICS - I (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - I

Answer any four questions (4 X 10 = 40 marks)

1. What are the desirable features of containers and closures ?
Explain about plastic containers ?
2. Classify various pharmaceutical dosage forms with suitable examples
3. Explain the methods for preparing syrups. Describe the preparation of compound ferrous phosphate syrup ?
4. What are suspensions ? Mention various suspending agents and write preparation of suspensions ?
5. What are the salient differences between maceration, percolation and hot continuous percolation ? Explain about maceration
6. Define the term incompatibility . What are different types of incompatibilities ? Explain about chemical incompatibility

SECTION - II

Answer any TEN questions (10 x 3 = 30 marks)

7. Explain about alligation method. Calculate the volumes of 30%, 40% and 60% v/v alcohol required to prepare 300 ml of 50% v/v alcohol.
8. Explain the evaluation of I.P.
9. Write a short notes on preservatives.
10. Write about preparation of purified water.
11. Write down the principle and procedure involved in the preparation of aromatic spirit of Ammonia.
12. Explain about milk of magnesia
13. Describe the process of decoction and infusion.
14. Write a note on displacement value
15. Write down the principle involved in the preparation of mandle's paint.
16. Describe the method of preparation of dry syrups.
17. Explain about therapeutic incompatibility
18. Identify the incompatibility and suggest suitable method of dispensing for the following prescription.

Rx Quinine sulphate : 1.5 gm
Dil. Sulphuric acid : 4 ml
Potassium Iodide : 8 gm
Water : 200 ml

Make a mixture.

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

MODEL QUESTION PAPER (Practical)

202 PHARMACEUTICS-I (General Pharmacy)

Time : 4 hours

Max.Marks : 70

1. Synopsis : 10 Marks
- 2* Major Experiment : 30 Marks
3. Minor Experiment : 20 Marks
4. Viva-Voce : 10 Marks

Total: 70 Marks

:: 62 ::

I/IV B.PHARMACY (1st & 2nd SEMESTERS)
203 PHARMACEUTICAL ANALYSIS-I (Theory) (75 hrs.)

Unit : 01

Balances : Different types and weighing, types of analysis, obtaining sample, measurement of sample and types of pipettes. Computation of Analytical Results: Significant numbers, sources of errors and their rectification, statistical treatment of the data and rejection of data. Ionic equations of solutions, stoichiometric and analytical problems; Determination of Normality, percentage purity, Molarity, Molality and their inter conversions.

Unit : 02

Impurities in Pharmaceuticals and Limit tests : Sources and effects of impurities in pharmacopoeial substances, importance of limit test, general principles and procedures for limit tests for chloride, sulphate, iron, arsenic, lead and heavy metals. Special procedures for limit tests.

Unit : 03

Principles of Volumetric and Gravimetric Analysis : Standardization; Use of primary and secondary standards. Acid base concept, common ion effect and solubility product, p^H and buffers. General principles and theory of acidimetry, alkalimetry, Oxidation, reduction methods, precipitation methods. An account of the indicators used in these titrations. Diazotisation titrations.

Unit : 04

Gravimetric methods : Typical methods involving precipitation, coagulation, incineration or digestion procedures.

Unit : 05

Complexometric titrations : Theory, types and application in pharmaceutical analysis. Masking and demasking agent and its application.

Non-aqueous Titrations : Theory, types and applications in pharmaceutical Analysis

Unit : 06

Determination of moisture content and alcohol content, theory and methods involved.

Good Laboratory Practices: Introduction to good laboratory practices. Importance of GLP in analysis of pharmaceuticals Principle of gas Analysis

I/IV B.PHARMACY (1st & 2nd SEMESTERS)

204 PHARMACEUTICAL ANALYSIS

(Practicals) (75 hrs.)

I-ACID-BASE TITRATIONS

01. Standardization of hydrochloric acid
02. Standardization of sodium hydroxide
03. Assay of sodium bicarbonate
- 04*. Assay of borax
05. Assay of ammonium chloride
- 06*. Assay of boric acid
- 07*. Assay of zinc oxide

II-REDOX TITRATIONS

- 08*. Assay of ferrous ammonium sulphate (Mohr's salt)
09. Assay of hydrogen peroxide solution
- 10*. Assay of copper sulphate

III-COMPLEXOMETRIC TITRATIONS

11. Assay of calcium lactate
- 12*. Assay of magnesium sulphate

IV-ANALYSIS OF PHARMACEUTICAL DOSAGE FORMS

13. Estimation of nalidixic acid in nalidixic acid oral suspension
14. Estimation of calcium gluconate in calcium gluconate injection.

V-LIMIT TESTS

15. Limit test for chlorides
16. Limit test for sulphates
17. Limit test for iron
- 18*. Limit test for arsenic

TEXT BOOKS :

01. Quantitative Inorganic Analysis by A.I.Vogel
02. Bentley and Driver – Text book of Pharmaceutical Chemistry
03. Practical Pharmaceutical Chemistry – A.H.Backett and J.B.Stenlake
04. Indian Pharmacopoeia
05. Quantitative Pharmaceutical Chemistry by Chatten.
06. Quantitative analysis by R.A.Day and A.L.Underwood.
07. Pharmaceutical analysis by P.C.Kamboj

I/IV B.PHARMACY (1st & 2nd SEMESTERS)
MODEL QUESTION PAPER
203 PHARMACEUTICAL ANALYSIS - I (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any FOUR questions

(4 x 10 = 40 marks)

1. What is Error ? Classify them. Give the sources of errors in analysis. How do you rectify them
2. Write in detail about "sources of impurities in Pharmaceuticals" ?
3. Explain the different theories of acid-base indicators in detail ?
4. Discuss various steps involved in a gravimetric method of analysis
5. Explain the different types of complexometric titrations in detail with suitable examples.
6. How do you estimate the content of moisture in a given sample by chemical method ?

SECTION - B

Answer any TEN questions

(10 x 3 = 30 marks)

7. What are the methods of weighing a sample in a balance ?
8. How do you minimise method errors ?
9. Give the principle involved in limit test for chlorides
10. Write procedure for limit test for Arsenic ?
11. What is a primary standard ? Explain ideal properties expected of it ?
12. Write notes on Fajan's method.
13. What is co-precipitation ? How do you minimise it ?
14. Write the filter media employed in gravimetry.
15. What are masking and densiting agents. Give two examples.
16. Explain how 0.1N perchloric acid prepared and standardised ?
17. Write the estimation of alcohol content by distillation method
18. Mention the applications of good laboratory practices in pharmaceutical analysis

I/IV B.PHARMACY (1st & 2nd SEMESTERS)
MODEL QUESTION PAPER (Practicals)
204 PHARMACEUTICAL ANALYSIS

Time : 4 hours

Max.Marks : 70

- | | | |
|---------------------|---|----------|
| 1. Synopsis | : | 10 Marks |
| 2* Major Experiment | : | 30 Marks |
| 3. Minor Experiment | : | 20 Marks |
| 4. Viva-Voce | : | 10 Marks |

Total: 70 Marks

I/IV B.PHARMACY (1st & 2nd SEMESTER)
205 ENVIRONMENTAL STUDIES (Theory) (75 hrs.)

Unit : 01

Module 1: Introduction

- Definition, scope and importance
- Measuring and defining environment development : indicators

Module 2: Ecosystems

- Introduction, types, characteristic features, structure and functions of Ecosystems
- Forest
- Grassland
- Desert
- Aquatic (lakes, rivers, and estuaries)

Module 3: Environment and Natural Resources Management

Land Resources

- Land as a resource
- Common property resources
- Land degradation
- Soil erosion and desertification
- Effects of modern agriculture, fertilizer-pesticide problems,

Forest resources

- Use and over-exploitation
- Mining and dams – their effects on forest and tribal people

Water resources

- Use and over-utilization of surface and ground water
- Floods, droughts
- Water logging and salinity
- Dams – benefits and costs
- Conflicts over water

Energy resources

- Energy needs
- Renewable and non – renewable energy sources
- Use of alternate energy sources
- Impact of energy use on environment

Unit : 02

Module 4: Bio – diversity and its conservation

- Value of bio-diversity - consumptive and productive use, social, ethical, aesthetic and option values.
- Bio-geographical classification of India – India as a mega diversity habitat.
- Threats to biodiversity – Hot spots, habitat loss, poaching of wildlife, loss of species, seeds, etc.
- Conservation of bio-diversity, In-situ and Ex-situ conservation

Unit : 03

Module 5: Environmental pollution – Local and Global Issues

- Causes, effects and control measures of
- Air pollution
- Indoor air pollution
- Water pollution
- Soil pollution
- Marine Pollution
- Noise pollution
- Solid waste management, composting, vermiculture
- Urban and industrial wastes, recycling and re-use.
- Nature of thermal pollution and nuclear hazards
- Global Warming
- Acid Rain
- Ozone layer depletion

Module 6: Environmental Problems in India

- Drinking water, Sanitation and public health
- Effects of activities on the quality of environment
 - * Urbanization
 - * Transportation
 - * Industrialization
 - * Green revolution
- Water scarcity and Ground Water depletion
- Controversies on major dams, - resettlement and rehabilitation of people: Problems and concerns
- Rain water harvesting, cloud seeding and watershed management

Unit : 04

Module 7: Economy and Environment

- The economy and environment interaction
- Economics of development, preservation and conservation
- Sustainability; theory and practice
- Limits to Growth
- Equitable use of resources for sustainable lifestyles
- Environmental Impact Assessment

Module 8: Social Issues and the Environment

- Population growth and environment
- Environmental education
- Environmental movements
- Environment vs Development

Unit : 05

Module 9: Institutions and Governance

- Regulation by Government
- Monitoring and Enforcement of Environmental regulation
- Environmental Acts
 - Water (Prevention and Control of pollution) act
 - Air (Prevention and Control of pollution) act
 - Envt. Protection act
 - Wild life Protection act
 - Forest Conservation act
 - Coastal Zone Regulations
- Institutions and policies relating to India
- Environmental Governance

Module 10: International Conventions

- Stockholm Conference 1972
- Earth Summit 1992
- World Commission for Environmental Development (WCED)

Unit : 06

Module 11: Case Studies

- Chipko movement
- Narmada Bachao Andolan
- Silent Valley project
- Madhura Refinery and Taj Mahal
- Industrilisation of Pattancheru
- Nuclear reactor at Nagarjuna Sagar
- Tehri Dam
- Relegan Siddhi (Anna Hazare)
- Kolleru lake – aquaculture
- Fluorosis in Andhra pradesh

Module 12: Field work

- Visit to a local area to document and mapping environmental assets
 - river/ forest/ grass land/ hill/ mountain
- Study of local environment – common plants, insects, birds
- Study of simple ecosystems – pond, river, hill, slopes etc.
- Visits to Industries, Water treatment Plants, Effluent treatment plants.

TEXT BOOKS :

1. Introduction to Environmental sciences by Y.Anjaneyulu,
2. Environmental sciences by Dr.U.Sai Jyothi.
3. A text book of Environmental science by Aravind Kumar
4. A text book of Environmental sciences by Purohit, Shammi, Agrawal
5. Environmental sciences by Kaushik
6. Principles of Environmental studies by C.Manoharachary & P.Jayarama Reddy.
7. Ecology and Environment by P.D.Sharma.
8. Environmental studies (for U.G.) - J.P.Sharma

I/IV B.PHARMACY (1st & 2nd SEMESTER)

MODEL QUESTION PAPER

205 ENVIRONMENTAL STUDIES (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any FOUR questions (4 X 10 = 40 marks)

1. Write an essay on structure and function of any one ecosystem.
2. Why bio diversity is so important. Delimate clearly the threats to bio diversity
3. Write in detail about causes, effects and control measures of water pollution.
4. Narrate the concept of sustainable development.
5. Write the role of regulatory and non governmental organizations in environmental protection.
6. Write notes on (i) Chipko movement (ii) Fluorosis in Andhra Pradesh

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. Explain the role of decomposers.
8. Write notes on soil erosion.
9. Explain values of bio-diversity.
10. Write notes on conservation of bio-diversity.
11. Explain the consequences of global warming.
12. Discuss the environmental problems associated with urbanization.
13. Discuss non formal environmental education.
14. What is population explosion ? How it effects environment ? Explain briefly.
15. Explain wild life protection act.
16. Write notes on significance of stockholm conference 1972.
17. Explain about Nuclear reactor at Nagarjuna Sagar.
18. Write on Narmada Bachao Andolan.

A.N.U. B.PHARMACY SYLLABUS (WITH EFFECT FROM 2012 - 13 ACADEMIC YEAR)

Course No.	SUBJECT	Periods per week		Exam. Duration (hrs)	Marks		TOTAL
		Theory	Practical		Sessio-nal	Semest-er end	
II/IV B.PHARMACY 3rd SEMESTER							
301	Pharmaceutical Chemistry-II (Organic-II) (Theory)	6	---	3	30	70	100
302	Pharmaceutical Chemistry-II (Practicals)	---	6	4	30	70	100
303	Pharmaceutical Engineering-I (Theory)	6	---	3	30	70	100
304	Pharmaceutical Microbiology (Theory)	6	---	3	30	70	100
305	Pharmaceutical Microbiology (Practicals)	---	6	4	30	70	100
306	Anatomy & Physiology (Theory)	6	---	3	30	70	100
307	Anatomy & Physiology (Practicals)	---	6	4	30	70	100
	Total	24	18	24	210	490	700
II/IV B.PHARMACY 4th SEMESTER							
401	Pharmaceutical Chemistry-III (Medicinal-I) (Theory)	6	---	3	30	70	100
402	Physical Pharmacy-II (Theory)	6	---	3	30	70	100
403	Physical Pharmacy-II (Practicals)	---	6	4	30	70	100
404	Applied Biochemistry & Clinical Pathology (Theory)	6	---	3	30	70	100
405	Applied Biochemistry & Clinical Pathology (Practicals)	---	6	4	30	70	100
406	Forensic Pharmacy (Theory)	4	---	3	30	70	100
407	English & Communication Skills (Language Laboratory) (Practicals)	---	6	3	30	70	100
	Total :	22	18	23	210	490	700

:: 70 ::

II/IV B.PHARMACY (3rd SEMESTER)
301 PHARMACEUTICAL CHEMISTRY –II (ORGANIC-II)
(Theory) (75 hrs.)

Unit : 01 Stereochemistry :

- Stereo isomerism, tetrahedral optical activity, enantiomerism, diastereoisomerism, meso structures, elements of symmetry, chirality, chiral centers, absolute configuration, specification of D and L configuration. Nature of E and Z forms. Racemic modification and resolution of racemic mixture, conformational isomers, asymmetric synthesis.
- Geometrical isomerism :** Principles, nomenclature of isomers, determination of configuration.
- Stereochemistry of alicyclic compounds, biphenyls and oximes.

Unit : 02 Chemistry of Aromatic compounds :

- Aromaticity, structure of benzene, stability of benzene, general methods to prepare aryl halides.
- Mechanism of electrophilic aromatic substitution (nitration, sulphonation, Halogenation, Friedel Craft's alkylation, acylation), Electrophilic aromatic substitution reactions of substituted benzenes, including reactivity, orientation and influence of activating and deactivating groups, mechanisms of nucleophilic aromatic substitution and mechanisms of electrophilic and nucleophilic addition reactions of α , β -unsaturated carbonyl compounds.
- General methods of preparation and chemical reactions of amines, phenols and diazonium salts.

Unit : 03 Chemistry of polynuclear aromatic hydrocarbons :

Synthesis (Haworth's), properties and chemical reactions of naphthalene, phenanthrene and anthracene. Structure and medicinal uses of propranolol, Tolnaftate, menadione, naphazoline, phenindione, morphine and codeine.

Unit : 04 Chemistry of heterocyclic compounds :

- General classification and nomenclature of heterocyclic compounds
- Synthesis, properties and reactions of furan, pyrrole, thiophene, pyridine, quinoline and isoquinoline.
- Structures of acridine, benzopyran, pyrazole, imidazole, benzimidazole, oxazole, isoxazole, thiazole, pyrimidine, pyridazine and phenothiazine.
- Structure and medicinal uses of phenazocine, nicotinic acid, nikethamide, isoniazid, mepyrmine, benzhexol, chloroquine, histamine, carbimazole, pyrimethamine, piperazine, diazepam, diethylcarbamazine citrate, sulphadiazine, metronidazole.

Unit : 05 Name reactions:

Beckmann, Fries, Schmidt rearrangements; Clemmensen reduction, Oppenauer oxidation, Mannich reaction and Phillips reaction.

Unit : 06 Reagents used in organic synthesis:

Preparation and applications of N- Bromo succinimide, Lead tetra acetate and Lithium Aluminium hydride.

II/IV B.PHARMACY (3rd SEMESTER)
302 PHARMACEUTICAL CHEMISTRY-II
(Practicals) (75 hrs.)

- 01*. Qualitative analysis of organic binary mixtures containing water insoluble organic compounds (05 organic binary mixtures should be analyzed)
- 02) Preparation of methyl orange
- 03) Preparation of methanamine (Urotropine)
- 04*) Preparation of para nitro aniline
- 05*) Preparation of para bromo aniline from acetanilide.
- 06) Preparation of fluoroscine

TEXT BOOKS :

01. R.T.Morrison and R.N.Boyd, "Organic Chemistry", Allyn and Bacon, Inc., Boston.
02. I.L.Finar, "Organic Chemistry", Vol. 1, The English Language Book Society, London.
03. B.S.Furniss, A.J.Hannaford, V.Rogers, P.W.G.Smith and A.H.Tatchell, Vogel's Text Book of Practical Organic Chemistry The English Language Book Society.
04. F.G.Mann and B.C.Saunders, Practical Organic Chemistry, Longmans, Green & Co., Ltd., London.
05. R.M.Acheson, An introduction to the Chemistry of Heterocyclic Compounds, Interscience Publishers, New York.
07. Rama Rao Nadendla, Pharmaceutical Organic Chemistry, (Chemistry of Heterocyclic and Natural Compounds), Vallabh Publications, New Delhi

II/IV B.PHARMACY (3rd SEMESTER)

MODEL QUESTION PAPER

301 PHARMACEUTICAL CHEMISTRY-II (ORGANIC-II) (Theory)

Time : 3 hours

Max.Marks : 70

SECTION-A

Answer any four questions (4 X 10 = 40 marks)

1. What do you mean by R and S configuration? Explain this with suitable examples and discuss the sequence rules that help in the determination of configuration.
2. What is aromaticity? Why benzene is called as an aromatic compound?
3. What are polynuclear aromatic compounds? Discuss the method of preparation and reactions of naphthalene?
4. Write the synthesis and important reactions of pyrrole and quinoline.
5. Discuss the importance of Beckmann rearrangement in organic synthesis?
6. Discuss the use of Lithium aluminium hydride in organic synthesis?

SECTION - B

Answer any TEN questions (10 X 3 = 30 marks)

7. Justify the statement "E & Z notation is more useful for polyolefinic compounds?"
8. Define the terms chirality and racemisation by giving suitable examples.
9. "Aromatic compounds undergo electrophilic substitutions". Justify the above statement.
10. Describe any three methods for the preparation of phenol.
11. Why naphthalene is more resistant to oxidation when compared to anthracene and phenanthrene?
12. Give the structure and medicinal uses of morphine, propranolol and naphazoline.
13. Give the structure and numbering of acridine, benzopyran, imidazole and 1,2-diazine.
14. Give the structure, chemical name and medicinal uses of metronidazole, histamine.
15. Discuss the mechanism of Fries rearrangement.
16. Write short notes on Mannich reaction.
17. Write short notes on applications of lead tetra acetate.
18. Give the importance of N-Bromo succinamide in organic synthesis.

II/IV B.PHARMACY (3rd SEMESTER)

MODEL QUESTION PAPER (Practicals)

302 PHARMACEUTICAL CHEMISTRY-III

Time : 4 hours

Max.Marks : 70

1. Synopsis	:	10 Marks
2* Major Experiment	:	30 Marks
3. Minor Experiment	:	20 Marks
4. Viva-Voce	:	10 Marks

Total:		70 Marks

II/IV B.PHARMACY (3rd SEMESTER)

303 PHARMACEUTICAL ENGINEERING-I (Theory) (75 hrs.)

Unit : 01

Introduction : Fundamental concept of material and energy balances, Units and Dimensions : Simple inter-conversions of units used in engineering calculations, dimensional analysis, Definitions of Stoichiometry, Unit operation, unit process and chemical technology, laboratory scale, pilot scale and industrial scale operations.

Unit : 02

Flow of fluids : Concepts of fluid statics and dynamics, construction of simple, differential and inclined manometers. Reynolds's number, Bernoulli's theorem and definition of head, friction losses, enlargement losses contraction losses, study of orifice meter, venturimeter, pilot tube and rotameter, simple problems on Bernoulli's theorem, friction losses and flow meters.

Transportation solids : Construction details advantages and disadvantages of belt conveyors, screw conveyors and pneumatic conveyors, bucket elevators.

Transportation of Fluids : Pipe standards, Joints fittings, cocks, globe valve, check valves, regulating valve, pumps, piston pump, plunger/pump, diaphragm pump, rotary pump, single stage suction centrifuge pump, self priming pump. Performance of reciprocating and centrifugal pumps

Unit : 03

Materials of pharmaceutical plant construction : Importance of materials in construction, the merits and demerits of different commonly used materials in plant construction such as iron, steel, copper, tin, aluminum, glass, rubber and plastic. Concept of corrosion, scale formation factors in forming corrosion, methods of reducing corrosion. Mechanical, Chemical, Electrical, Fire and Dust hazards. Industrial dermatitis, Accident Records.

Unit : 04

Humidity and air-conditioning : Definitions of humidity, relative humidity, percentage humidity, humid heat, humid volume, dew point, humidity chart, wet bulb theory, factors influencing the wet temperature, adiabatic saturation temperature. Theory of air - conditioning and description of equipment. Refrigeration principle and description of equipment.

Unit : 05

Mixing : Solid – Solid mixing- Mechanisms of Mixers-V-type, paddle and Rototube mixers- selection of mixer- Mixing of viscous masses, kneading machines and ointment mills-Liquid-Liquid equipment, impellers-their characteristics.

Unit : 06

Size reduction and Separation : Importance of size reduction. Theories of size reduction, factors Influencing size reduction, energy in size reduction, cutter mill, ball mill ,fluid energy mill, hammer mill, colloid mill-Selection of machinery. Principles of size separation, particle size distribution- Representation of screens, screening equipment, trommels, shaking and vibrating screens gyratory screens, cyclone, air and hydraulic separator, bag – filter, Cottrell precipitator, scrubber, sedimentation theory.

TEXT BOOKS :

01. Introduction to chemical Engineering by Badger and Banchemo
02. Pharmaceutical Engineering by K.Samba Murthy
03. Principles of Engineering Drawing by A.C.Parkinson
04. Pharmaceutical Engineering by C.V.S.Subrahmanyam,
05. Pharmaceutical Engineering by Dr.Girish K.Jani
06. Introduction to Pharmaceutical Engineering by Dr.A.R.Paradkar
07. Cooper and Gunns tutorial pharmacy by S.J.Carter.

II/IV B.PHARMACY (3rd SEMESTER)

MODEL QUESTION PAPER

303 PHARMACEUTICAL ENGINEERING - I

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. Define unit operation and unit process in pharmaceutical industry with suitable examples. Distinguish between lab scale, pilot scale and industrial scale operations.
2. Explain the working of gate valve, globe valve and diaphragm valve
3. Write the importance of materials used in pharmaceutical plant construction and merits, demerits of commonly used materials.
4. Describe the basic construction of refrigeration
5. Discuss the construction, working and advantages of mixer useful for wet granulation.
6. Explain the construction, working and applications of fluid energy mill.

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. Write the significance of Reynold's number
8. What do you understand by energy and mass balance
9. Write about the check valve and its applications
10. Distinguish between reciprocating pump and centrifugal pump
11. Define the terms relative humidity, humid heat, dew point and humid volume
12. What is corrosion ? How do you minimise it ?
13. Write the applications of humidity in pharmacy
14. Write the steps involved in refrigeration cycle
15. Write briefly on V-type mixer
16. What is air binding ? How it is prevented ?
17. Give the applications of colloid mill in pharmacy
18. Write short notes on sieve analysis.

II/IV B.PHARMACY (3rd SEMESTER)
304 PHARMACEUTICAL MICROBIOLOGY
(Theory) (75 hrs.)

Unit : 01

Study of morphology, classification of bacteria, yeasts, actinomycetes, protozoa, fungi and viruses. Mutation, Mutagens, Bacterial Conjugation, Transformation and transduction.

Unit : 02

Preparation of media for bacterial, fungal and actinomycete cultures. Different methods for isolation, purification and preservation of microbial cultures. Introduction to microbiology of water, air and milk and methods of quantitative evaluation of microbial contamination.

Unit : 03

Theory of staining, Gram, acidfast, flagella, spore staining methods. Study of bacterial growth : effect of UV light, ultrasonic waves, temperature, pH, osmotic pressure, salt concentration and metal ions.

Unit : 04

An outline of theories of antimicrobial action of drugs and chemicals. Study of sterilization by moist and dry heat, construction and working of autoclave, sterilization by filtration, radiations and gases. Dynamics of disinfection, disinfectants - the mechanism of action, merits and demerits. Evaluation of bacteriocides and bacteriostatics.

Unit : 05

Principles of immunology, methods of transmission of disease carriers, vectors and reservoirs, General methods of Immunization against diseases. Fundamentals of serology : Neutralization, Precipitation, Opsonization, agglutination, complement fixation tests and ELISA.

Unit : 06

The study of etiology, diagnosis, source of infection, mode of transmission, immunization methods, prevalence and control of the following diseases: Bacillary dysentery, diphtheria, tuberculosis, leprosy, cholera, syphilis, gonorrhoea, tetanus food poisoning, rabies, polio, detrameophytes, malaria and Amoebiasis, AIDS, Hepatitis.

II/IV B.PHARMACY (3rd SEMESTER)
305 PHARMACEUTICAL MICROBIOLOGY
(Practicals) (75 hrs.)

01. General rules and procedure in microbiology lab
02. Acquaintance of equipment in microbiology lab
03. Preparation of culture medium for bacteria and potato dextrose agar medium for fungi. Cultivation of microorganisms.
04. Aseptic culture transfer techniques.
05. Simple staining
- 06*. Gram staining
- 07*. Bacterial motility
08. Acid-fast staining
09. Negative Staining
10. Oligo dynamic action of copper
11. Isolation of pure cultures by streak plate method.
12. Spore Staining
13. Viable count of microbes of serial dilution method.
14. Rideal-walker test
15. Determination of antibiotic sensitivity
16. Effect of UV-rays on life of bacteria
17. Microscopic observation of fungi
18. Starch hydrolysis

TEXT BOOKS :

01. Microbiology by Pelczar
02. Text Book of Microbiology by Ananth Narayan.
03. Microbiology - An introduction by Toratora.
04. Microbiology by Prescott
05. Pharmaceutical Microbiology by Chandrakant R.Kokare
06. Immunology - by KUBY

II/IV B.PHARMACY (3rd SEMESTER)

MODEL QUESTION PAPER

304 PHARMACEUTICAL MICROBIOLOGY (Theory)

Time : 3 hours

Max.Marks : 70

PART - A

Answer any four questions (4 X 10 = 40 marks)

1. Explain in detail various modes of reproduction in bacteria
2. Explain different isolation and preservation methods of microbial cultures.
3. Explain various factors effecting bacterial growth
4. Classify disinfectants . Explain the mechanism of action of various disinfectants.
5. Define serology. Explain the principles involved in precipitation, agglutination, opsonization and complement fixation tests.
6. Explain the etiology, diagnosis, source of infection, immunization methods and control of Amoebiasis and syphilis.

PART - B

Answer any TEN questions (10 X 3 = 30 marks)

7. Differentiate Gram positive and Gram negative organisms along with neat diagrams
8. Classify viruses. Write about the structure of virus
9. Write two examples of differential media and selective media. Give the principle involved in use of these medias.
10. Write the quantitative evaluation methods for Milk
11. Define staining. Classify staining agents. Write the principle involved in staining.
12. Write the principle of gram's staining along with the procedure
13. Write the principle and working of autoclave.
14. Write the principle involved in sterilization by radiation and dry heat.
15. Define immunity. Write about various types of immunity.
16. Write the principle and procedure involved in different types of ELISA
17. Write the diagnosis, immunization methods and control of Tuberculosis.
18. Write diagnostic tests and control of Leprosy.

II/IV B.PHARMACY (3rd SEMESTER)

MODEL QUESTION PAPER (Practicals)

305 PHARMACEUTICAL MICROBIOLOGY

Time : 4 hours

Max.Marks : 70

1. Synopsis	:	10 Marks
2* Major Experiment	:	30 Marks
3. Minor Experiment	:	20 Marks
4. Viva-Voce	:	10 Marks

Total:		70 Marks

II/IV B.PHARMACY (3rd SEMESTER)

306 ANATOMY AND PHYSIOLOGY (Theory) (75 hrs.)

Unit : 01

Introduction : Introduction to anatomical terms in relation to parts of the body, systems and organs. Elementary knowledge of the human skeleton.

Tissues of the body: Properties and functions of epithelial, connective, muscular, nervous and osseous (bone) tissues. General principles of membrane permeability, diffusion, transport membrane potentials, action potentials.

Unit : 02

Nervous system : Neuron, synapses, ganglion, plexus, physiology of nerve impulse, neurotransmission, reflex arc, central nervous system (parts and functions) and autonomic nervous system.

Unit : 03

Cardiovascular system and Blood : Heart, blood Vessels, cardiac cycle, circulation, blood pressure and its regulation and blood (composition and functions)

Unit : 04

Respiratory system : Gross anatomy of respiratory passages, physiology of respiration, nervous control of respiration.

Digestive System : Gross anatomy of alimentary canal, movement of alimentary canal, gastric secretions and the enzymes involved in digestion.

Unit : 05

Endocrine System : Physiological considerations of thyroid, pancreas, pituitary, gonads and suprarenal glands.

Urinogenital System : General disposition of organs of excretion, physiological consideration of urine formation, out put, factors controlling it.

Unit : 06

Physiology of special senses : Hearing, vision, smell, taste and structure and functions of skin.

II/IV B.PHARMACY (3rd SEMESTER)

307 ANATOMY & PHYSIOLOGY (Practicals) (75 hrs.)

1. Study of Histology slides of different tissues/organs
2. **Study of specimens and bones :**
(Human heart, Human skeleton, Human Digestive system, Human Nose, Human Skin, Human tongue, Human Respiratory system, Human Eye, Human Brain.)
3. Determination of blood pressure
4. Determination of blood groups.
5. Determination of haemoglobin content of blood.
6. Determination of R.B.C. content of blood.
7. Determination of W.B.C. content of blood
8. Determination of bleeding time.
9. Determination of clotting time.
10. Determination of differential leukocyte count of blood.
11. Determination of erythrocyte sedimentation rate of blood.
12. Recording of normal cardiogram of frog's heart.
13. Effect of heat and cold on normal cardiogram of frog's heart.

TEXT BOOKS :

01. Text book of Medical Physiology by A.C.Guyton
02. Human Physiology by A.J.Vander, J.H.Sherman and D.S.Lucion
03. Samson Wright's applied physiology by Keele and Neil
04. The Living Body - A text book in human physiology by Best and Taylor.
05. Principles of Anatomy & Physiology by Tortora and Grabowski.
06. Ross and Wilson - Anatomy and Physiology by Anne waugh and Allison Grant.
07. Human physiology by Dr.C.C.Chaterjee.

II/IV B.PHARMACY (3rd SEMESTER)

MODEL QUESTION PAPER

306 ANATOMY & PHYSIOLOGY

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. Classify the tissues and with a neat sketch discuss the functions performed by each type of these tissues.
2. What is a synapse ? How the nerve impulses are transmitted through synapses.
3. What is the role of C.V.S. in the body ? Describe in detail the origin and conduction of heart beat.
4. What is digestion ? Draw a sketch of digestive system, label and discuss in detail the digestion taking place in the small intestine.
5. Draw a neat diagram of eye and discuss the physiology of vision.
6. What are endocrine glands ? Classify the Endocrine glands and describe the functions of various hormones released by posterior pituitary glands.

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. Write notes on transport of materials across the cell membrane.
8. Write notes on Action potential.
9. Write notes on Medulla oblongata.
10. Give notes on neurotransmitters.
11. Write about composition and functions of blood.
12. Write short notes on Anemia.
13. How the respiration is regulated ?
14. Give an account on transport of respiratory gases from lungs to tissues.
15. Write short notes on urine formation.
16. Give a brief note on role of pancreas.
17. Write short notes on skin.
18. Write short notes on ear.

II/IV B.PHARMACY (3rd SEMESTER)

MODEL QUESTION PAPER (Practicals)

307 ANATOMY & PHYSIOLOGY

Time : 4 hours

Max.Marks : 70

1. Identification	:	10 Marks
2. Synopsis	:	10 Marks
3* Major Experiment	:	30 Marks
4. Minor Experiment	:	10 Marks
5. Viva-Voce	:	10 Marks

Total:		70 Marks

II/IV B.Pharmacy (4th Semester)
401 PHARMACEUTICAL CHEMISTRY-III (MEDICINAL-I)
(Theory) (75 hrs.)

Unit : 01

Brief introduction to medicinal chemistry and development of medicinal chemistry, physicochemical properties of drugs in relation to biological action, drug receptor interaction, transduction mechanism and G-coupled receptors

Unit : 02

Sulphonamides: History, nomenclature, classification based on kinetics, clinical and chemical along with structures, metabolism crystal urea, prodrug concept in sulphonamides, structure activity relationship(SAR), Therapeutic uses metabolism and synthesis of sulphamethoxazole, trimethoprim, sulphacetamide, sulphapyridine, sulphasalazine, sulphamoxol, sulphafurazole, sulphaguanidine, sulphadoxine, sulphadimidine.

Antiinfective agents: Definition, classification, ideal requirements of antiinfectives, structures, synthesis and uses of important antiinfectives and synthesis of hexylresorcinol, nitrofurazone, chlorobutanol methylparaben.

Unit : 03

Antibiotics: Brief historical background and classification of antibiotics based on spectrum, nature, chemical and mechanism of action.

Penicillins: Historical background, biological sources, nomenclature, classification of penicillins based on source and spectrum of activity along with structures of different penicillins, degradation of penicillins, semi synthetic penicillins, the effect of stereochemistry in designing orally active penicillins, depot penicillin preparations, general method of synthesis of penicillins from 6-Amino penicillanic acid(APA), structure activity relationship(SAR), mechanism of action, synthesis and therapeutic uses of benzyl penicillin, ampicillin, amoxicillin, carbenicillin, phenoxymethyl penicillin. A note on β -lactamase inhibitors.

5. **Cephalosporins:** Biological sources, classification based on generation, degradation of cephalosporins, comparison of 6-Aminopenicillanic acid(APA) and 7-aminocephalosporanic acid (ACA), penam and cepham, structure activity relationship(SAR), advantages over penicillins, structures and synthesis of cephalexin, cephalexin, cefuroxime, cefatoxime, cefoperazone and cefaclor.

Tetracyclines : Biological sources, structures of the important tetracyclines, important structural units and the three acidity constants in the tetracycline molecule, amphoteric nature, epimerisation, chelation with metals, mechanism of action, spectrum of activity, structure activity relationship (SAR) and therapeutic uses.

Aminoglycosides: Structure, acid hydrolysis, mechanism of action, therapeutic uses, metabolism and toxicity of streptomycin. structure of dihydrostreptomycin and its importance. A mention of other aminoglycoside antibiotics. Synthesis, metabolism, SAR and therapeutic importance of levorotatory form of chloramphenicol.

Macrolides: Classification, structure activity relationship (SAR) metabolism and toxicity.

Fluoro Quinolone antibacterials : Structure activity relationship (SAR) of quinolones, metabolism and synthesis of norfloxacin, gatifloxacin, nalidixic acid, sparfloxacin, pefloxacin and ofloxacin.

Unit : 04

Antimalarials: Etiology of malaria, classification, mechanism of action, SAR, therapeutic uses, structures and synthesis of chloroquine, amodiaquine, primaquine, quinacrine, pyrimethamine and proguanil. A brief note on Artemisinin.

Anthelmintics: Definition, classification, mechanism of action of anthelmintics, synthesis and therapeutic uses of diethylcarbamazine, mebendazole, niclosamide, pyrantelpamoate, albendazole, piperazine citrate and niridazole

Antiamoebics: Classification and mechanism of action of antiamoebics, synthesis and therapeutic uses of metronidazole, diloxanide furoate, iodoquinol, furazolidone

Unit : 05

Antifungal agents: Introduction, classification, structures, mechanism of action and therapeutic uses of antifungal drugs, structure activity relationship(SAR) of azole antifungal agents, structures and synthesis of benzoic acid, salicylic acid, clotrimazole, ketoconazole, fluconazole, tolnaftate, miconazole, econazole, griseofulvin and flucytosine.

Anti-Tubercular Drugs: Introduction, classification, structure activity relationship (SAR), mechanism of action, structures of important antitubercular drugs and synthesis of INH, ethambutol, pyrazinamide, ethionamide and PAS

Antileprotics: Introduction, classification, structure activity relationship (SAR), metabolism, mechanism of action, synthesis of dapsone and clofazimine

Unit : 06

Antiviral Drugs : Properties of virus, types of viruses, viral replication, classification of antiviral drugs, chemical structures, mechanism of action and therapeutic uses of amantadine, nucleoside antimetabolites (idoxuridine, vidarabine, acyclovir, famciclovir), reverse transcriptase inhibitors (zidovudine, lamivudine, stavudine, zalcitabine), nucleoside antimetabolites (ribavirin), nonnucleoside reverse transcriptase inhibitors (nevirapine). A brief note on HIV protease inhibitors. Synthesis of amantadine and idoxuridine

Anticancer Drugs: Introduction, classification, mode of action, structures of important anticancer drugs, metabolism and synthesis of chlorambucil, cyclophosphamide, melphalan, cytarabine, 6-thioguanine, thiotepa, busulphan, procarbazine, carmustine, 5-fluorouracil, 5-mercaptopurine, methotrexate. A brief account of vinca alkaloids and taxol

TEXT BOOKS :

1. Text book of Medicinal Chemistry by William O. Foye, Lea Febiger, Philadelphia.
2. Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry by JH Block & JM Beale (Eds), 11th Ed, Lipcott, Raven, Philadelphia, 2004.
3. D. Abraham (Ed), Burger Medicinal chemistry and Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003,
4. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry L.M. Atherden. Oxford University Press, Delhi.
6. B.N. Lads, MG.Mandel and F.I. way, Fundamentals of drug metabolism & disposition, William & welking co, Baltimore USA.
7. C. Hansch, Comprehensive medicinal chemistry, Vol 1 - 6 Elsevier pergmon press, oxford 1991.
8. Daniel lednicer, Strategies For Organic Drug Synthesis And Design, John Wiley, N. Y. 1998.
9. Rama Rao Nadendla, Medicinal chemistry, Pharma Book Syndicate, Hyderabad, 2006
10. D. Lednicer, Organic drug synthesis, Vol, 1 - 6, J.Wiley N.Y.

II/IV B.Pharmacy (4th Semester)

MODEL QUESTION PAPER

PHARMACEUTICAL CHEMISTRY-II, (MEDICINAL -I)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. Outline the importance of any two physicochemical parameters in relation to biological activity. Explain with suitable examples.
2. Classify sulfonamides with examples, discuss the SAR and mention their mode of action.
3. Give the chemical classification of antibiotics. Give an account of the chemistry and stability of penicillin molecule.
4. What are antimalarials ? Classify them with examples and discuss the SAR ? Add a note on the current status of malaria in India.
5. What are antifungal agents ? Give the classification, mechanism and SAR of azole antifungal agents ?
6. What are antineoplastic agents ? Classify them with examples. Discuss the mode of action of alkylating agents ?

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. Explain briefly how partition coefficient influences biological activity ?
8. Define and classify receptors with suitable examples ?
9. Outline the synthesis and uses of sulfamethoxazole.
10. What is crystal urea ? Suggest the preventive measures of crystal urea.
11. Write a short note on β -lactamase inhibitors
12. Give an account of epimerisation and chelation of tetracyclins.
13. Outline the synthesis and mode of action of Albendazole.
14. Give the structure and chemical name of any two antiamebic agents.
15. Give the synthetic scheme for flucytocine
16. Write short notes on anti-tubercular agents.
17. Give a brief note on chemistry of DNA polymerase inhibitors.
18. Write short notes on plant products used in cancer chemotherapy.

II/IV B.Pharmacy (4th Semester)

402 PHYSICAL PHARMACY-II (Theory) (75 hrs.)

Study of the applications of physicochemical principles to pharmacy with special reference to the following :

Unit : 01

Solubility and Distribution phenomena : Solvent-Solute interactions, solubility of gases in liquids, liquids in liquids, solids in liquids, distribution of solutes in immiscible solvents. Introduction to phenomena of diffusion : Ficks first law and second law.

Complexation : Types of Complexes, methods of analysis, complexation and drug action.

Unit : 02

Kinetics : Rates and orders of reactions, determination of order of a reaction. Influence of temperature and other factors on reaction rates. Decomposition of medicinal agents. Methods and principles of stabilization, accelerated stability analysis.

Unit : 03

Interfacial Phenomena : Liquid interfaces, measurement of surface and interfacial tensions, adsorption at liquid interfaces. Surface active agents, systems of hydrophilic – lipophilic classification. Adsorption at solid interfaces. Electrical properties of interfaces.

Unit : 04

Colloids and macromolecular systems : Types of colloidal systems, properties of colloidal Systems, solubilization.

Micromeritics : Particle size and size distribution, methods of determination of particle size, particle shapes and surface area. Derived properties of powders.

Unit : 05

Rheology : Newtonian and Non-Newtonian systems. Thixotropy, its measurement and applications in formulations. Determination of viscosity using rotational viscometers and its applications.

Unit : 06

Coarse Dispersions : Suspensions, emulsions and semisolids :

Suspensions : Interfacial properties of suspended particles, settling in suspensions, formulation of suspensions.

Emulsions : Theories of emulsification, physical stability of emulsions, preservation of emulsions.

Rheological properties of emulsions, suspensions and semisolids.

II/IV B.Pharmacy (4th Semester)

403 PHYSICAL PHARMACY-II (Practicals) (75 hrs.)

01. Effect of phase volume ratio on stability of an emulsion.
02. Micromeritics – I
03. Micromeritics – II
04. Determination of partition coefficient of salicylic acid between water and benzene
05. Determination of first order rate constant associated with decomposition of hydrogen peroxide.
- 06*. Determination of HLB value of Tween-80
- 07*. Determination of critical micellar concentration of tween-80.
08. Micellar solubilisation of poorly soluble drugs.
- 09*. Determination of first order rate constant associated with decomposition of ethyl acetate
10. Determination of particle size by stokes method.
11. Accelerated stability testing of a tablet formulation-I.
12. Accelerated stability testing of a tablet formulation – II.
13. Accelerated stability testing of a tablet formulation by short cut method.
- 14*. Calibration of eye piece micrometer using stage micrometer and determination of globule size of an emulsion.
- 15*. Study of adsorption of oxalic acid on charcoal.

TEXT BOOKS :

- 01.Physical Pharmacy by Alfred Martin
- 02.Remington's Pharmaceutical Sciences.
- 03.Tutorial pharmacy.

II/IV B.Pharmacy (4th Semester)
MODEL QUESTION PAPER
402 PHYSICAL PHARMACY-II (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any FOUR questions (4 X 10 = 40 marks)

01. State and explain Nernst's distribution law. Discuss its application in determination of stability constant of a complex with an example.
02. Discuss the principle and method involved in accelerated stability testing of dosage forms. Give its limitations.
03. With a neat labelled diagram explain the concept of electric double layer at solid liquid interfaces. Give the significance of zeta potential in formulations of suspensions.
04. What are colloids. Discuss the optical and kinetic properties of colloids.
05. What is thixotropy. Discuss the methods to measure it and give applications of thixotropy in pharmacy.
06. Differentiate between flocculated and deflocculated suspension. Taking an example, explain about controlled flocculation.

SECTION-A

Answer any TEN questions (10 X 3 = 30 marks)

07. State and explain Fick's first law of diffusion.
08. Give the applications of complexation in pharmacy
09. Differentiate between zero order and first order kinetics.
10. A tablet contains 500 mg of paracetamol. The tablet was manufactured on 10/07/1999. Paracetamol in the tablet decomposes according to zero order kinetics at the rate of 10 mg/year. What is the expiry date to be printed on the label.
11. What is HLB value. Give the functional classification of surfactants basing on HLB value. Give any one method for determination of HLB value of a surfactant.
12. Write notes on spreading and spreading coefficient.
13. What is total porosity, inter particle porosity and inter particle porosity. Give its significance in pharmacy.
14. Write notes on micellar solubilization.
15. How do you determine the viscosity of a pseudoplastic system using storrer viscometer.
16. Discuss the rheology of Bingham bodies.
17. How do you evaluate the physical stability of emulsions.
18. Write notes on sedimentation parameters of suspensions.

II/IV B.Pharmacy (4th Semester)
MODEL QUESTION PAPER (Practicals)
403 PHYSICAL PHARMACY-II

Time : 4 hours

Max.Marks : 70

- | | | |
|----------------------|---|----------|
| 1. Synopsis | : | 10 Marks |
| 2*. Major Experiment | : | 30 Marks |
| 3. Minor Experiment | : | 20 Marks |
| 4. Viva-Voce | : | 10 Marks |

Total: 70 Marks

:: 89 ::

II/IV B.Pharmacy (4th Semester)
404 APPLIED BIO CHEMISTRY & CLINICAL
PATHOLOGY (Theory) (75 hrs.)

Unit : 01

Definition, classification, some properties and reactions of carbohydrates, lipids and proteins. Diseases related to their metabolism.

Unit : 02

Carbohydrate metabolism : Glycolysis, glycogenolysis, gluconeogenesis, Krebs' cycle, direct oxidative pathway (HMP). Metabolism of lipids. Essentials of fatty acids, Oxidation of fatty acids, ketogenesis, biosynthesis of fatty acids and cholesterol.

Unit : 03

Metabolism of Proteins and Amino acids : Essential and Non essential Amino acids, general metabolic reactions of amino acids like deamination, transamination, decarboxylation, urea cycle : metabolism of the following aminoacids, glycine, phenylalanine, tyrosine, cyctein, cystine, methionine, tryptophan, valise and lysine.

Unit : 04

Enzymes: classification, structure, mechanism of enzyme action properties, factors influencing enzyme action, activators and deactivators of enzymes , competitive and noncompetitive inhibition with respect to drug action, co-enzymes.

Unit : 05

Bio-chemistry of important body fluids. The biochemical role of minerals, water vitamins and hormones. A brief outline of energy and phosphate metabolism and detoxication mechanisms.

Unit : 06

The Principles involved and the method used in qualitative and quantitative analysis of

a) Blood for the following constituents :

Glucose ,urea, cholesterol, bile salts , bile pigments, creatinine, calcium, phosphates, SGPT and SGOPT.

b) Urine for the following constituents :

Gglucose , ketone bodies, bile Salts, bile pigments, and albumin

c) Introduction to pathology of blood and urine

- (1) Lymphocytes and Platelets , their role in health and disease
- (2) Erythrocytes Abnormal cells, their significance
- (3) Abnormal constituents of urine and their significance in disease.

II/IV B.Pharmacy (4th Semester)

405 APPLIED BIOCHEMISTRY & CLINICAL PATHOLOGY
(Practicals) (75 hrs.)

01. Qualitative analysis of carbohydrates
(Glucose, Fructose, Maltose, Lactose, Sucrose, Starch).
02. Qualitative analysis of Amino acids (Glycine, Tyrosine, Cysteine
03. Qualitative analysis of Proteins (Albumin, Casein, Gelatin, Peptone)
04. Identification of normal and abnormal constituents in normal urine sample.
05. Identification of abnormal constituents in the given sample.
- 06*. Estimation of glucose in urine.
- 07*. Colorimetric estimation of tyrosine.
- 08*. Estimation of creatinine in urine.
- 09*. Estimation of glucose in blood.
- 10*. Estimation of creatinine in blood.
- 11*. Estimation of valine by formal titration.
12. Simple enzymatic reaction.

TEXT BOOKS :

01. Text book of Biochemistry by Harper
02. Text book of Biochemistry by Lelinger
03. Biochemistry by A.V.S.Rama Rao
04. Biochemistry by West and Todd.
05. Biochemistry by U.Satyanarayana.
06. Text book of Biochemistry by D.M.Vasudevan, Sree Kumari S
07. Medical Biochemistry by N.Mallikarjuna Rao
08. Test book of Biochemistry with clinical correlatives by Devlin.

II/IV B.Pharmacy (4th Semester)

MODEL QUESTION PAPER

404 BIOCHEMISTRY (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. Explain the color reactions of proteins.
2. Discuss the direct oxidative pathway for the metabolism of glucose
3. Explain the general metabolic reactions of amino acids
4. What are enzymes ? Give the classification of enzymes with suitable examples.
5. Write an essay on biochemistry of body fluids.
6. Write the principles of methods used in quantitative analysis of calcium and creatinine in blood ?

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. What are essential and non-essential amino acids ?
8. Discuss the Haworth's cyclic structures of monosaccharides
9. Write a short note on ketogenesis
10. Write a short note on HMP pathway
11. Explain the biosynthesis of urea
12. Discuss briefly about the metabolism of glycine
13. Write a note on mechanism of enzymic action.
14. Write short notes on coenzymes.
15. Give an account of phosphate metabolism.
16. Explain the biochemical role of vitamin-C
17. Role of lymphocytes in health and disease.
18. How do you identify glucose and blood in urine ? Give the significance of above two abnormal constituents.

II/IV B.Pharmacy (4th Semester)

MODEL QUESTION PAPER (Practicals)

405 APPLIED BIO-CHEMISTRY AND CLINICAL PATHOLOGY

Time : 4 hours

Max.Marks : 70

- | | | |
|----------------------|---|----------|
| 1. Synopsis | : | 10 Marks |
| 2*. Major Experiment | : | 30 Marks |
| 3. Minor Experiment | : | 20 Marks |
| 4. Viva-Voce | : | 10 Marks |

Total: 70 Marks

II/IV B.PHARMACY (4th SEMESTER)
406 FORENSIC PHARMACY (Theory) (75 hrs.)

Unit : 01

Evolution of pharmaceutical and drug legislation in India –Code of Pharmaceutical ethics.

Legislation to regulate the profession of the pharmacy. The pharmacy Act, 1948.

Unit : 2 & 3

Legislation to regulate the import, manufacture, distribution and sales of drugs and cosmetics – The Drugs and cosmetics Act 1940 and Drugs and Cosmetics Rules 1945, as corrected upto –date.

Unit : 04

Legislation to control the advertisements , excise duties and price of drugs.

- a) The Drugs and Magic Remedies (Objectionable advertisement Act.)
- b) The Medicinal and Toilet preparations (Excise duties Act and Rules of 1956)
- c) Drugs (Price Control) Order ,1970 as corrected upto-date

Unit : 05

Legislations to control the operations regulating to dangerous drugs, poisons and opium.

- a) Poisons Act and Rules
- b) The Narcotic Drugs and Psychotropic Substances act, 1985.

Unit : 06

Other Legislation's relating to Pharmaceutical Industry and profession.

- a) The Indian Patents and Designs Act,1970 with reference to the Drugs and Pharmaceuticals only.
- b) Medical Termination of Pregnancy Act.
- c) Shops and Establishments Act
- d) Prevention of Cruelty to Animals Act 1960.

TEXT BOOKS :

01. Forensic Pharmacy by B.M.Mithal
02. Forensic Pharmacy by N.K.Jain
03. Text book of Forensic Pharmacy, C.K.Kokate, S.B.Gokhale
04. Forensic Pharmacy by B.S.Kuchekar, A.H.Khadatara, Sachin.C. Itkar.
05. Pharmaceutical jurisprudence and ethics by S.P.Agarwal, Rajesh Kanna

II/IV B.PHARMACY (4th SEMESTER)

MODEL QUESTION PAPER

FORENSIC PHARMACY

Time : 3 hours

Max.Marks : 70

SECTION-A

Answer any FOUR questions (4 X 10 = 40 marks)

1. What are the objectives of pharmacy act, Discuss the constitution and functions of pharmacy council of India
2. Classify the licenses issued for the sale of drugs. Explain the licensing requirements and procedure involved in retail sale of drugs.
3. What are the administrative bodies constituted under drugs and cosmetics act. Write the constitution and functions of DTAB
4. Define (A) Bonded manufactory (B) Proof spirit. Explain the steps involved in the manufacture of medicinal preparations in a bonded manufactory
5. What are narcotic drugs and psychotropic substances. Explain the various controlled operations and measures taken by central government to prevent illicit traffic in narcotics and psychotropic substances
6. What is (A) Patent (B) Invention. Mention the inventions patentable under the patents act. Write the procedure involved in patenting

SECTION - B

Answer any TEN questions (10 X 3 = 30 marks)

7. Enumerate the events before 1940 that led to the enactment by pharmacy act.
8. Explain the code of ethics of pharmacist in relation to trade.
9. Mention the classes of drugs prohibited for import into india. Write the procedure for importing drugs.
10. What are the qualifications and duties of government analyst.
11. Write a note on schedules to the drugs and cosmetics act 1945.
12. Define (A) drug (B) cosmetic (C) Misbranded drug (D) Spurious drug.
13. What are the salient features of DPCO 1987 and DPCO 1995.
14. List out the advertisements prohibited under objectionable advertisement act.
15. What is opium poppy. Explain the cultivation of opium.
16. Write short notes on poisons act and rules.
17. What are the conditions of working laid down under the shops and establishment act.
18. Write the constitution and functions of Institutional animal ethics committee.

407 ENGLISH & COMMUNICATION SKILLS
(LANGUAGE LABORATORY) (Practicals) (50 hrs.)

01. Functional and advanced grammar
 - i. Basics of english language
 - ii. Tips to learn english language
 - iii. Articles
 - iv. Complete version of parts of speech
 - v. Complete version of tenses
 - vi. Direct and indirect speech
 - vii. Active and passive voice
 - viii. Analysis of sentences
 - ix. Degrees of comparison
 - x. Question tags
02. Verbal and Non-Verbal Skills
 - i. Verbal - concerned with words only; corresponding word for word.
 - ii. Non - verbal - posture and gesture; facial expressions; sign or code language.
03. Accent – Modulation / Pronunciation
 - i. Word accent
 - ii. Stress and rhythm in corrected speech
 - iii. Intonation - falling pitch, rising pitch, rising – falling tone
 - iv. Some common errors in pronunciation
04. Vocabulary Enhancement
 - i. Level -I words
 - ii. Level - II words
 - iii. Level – III words
 - iv. Synonyms and antonyms and their basic word
05. Speaking / Writing Tasks
 - i. Topics to be practiced orally and in written form to enhance speaking skills and writing skills.
06. Presentation Skills
 - i. Model presentation
 - ii. Resume preparation
 - iii. Conversation and telephone etiquette skills

07. Extempore / Elocution
 - i. Students are advised to involve in this activity as it develops one's potentiality and to a creative way of thinking and their involvement in general awareness.
08. Personality Development
 - i. The art of being dynamic – four dimensions
 - ii. Self-analyzing questions
 - iii. Human refinement and soft Skills
09. Communication Skills
 - i. Value of English
 - ii. Status of english in India
 - iii. Language and communication skills
 - iv. Communication skills in corporate requirements
10. Group Discussions
 - i. Group dynamics
 - ii. Some selected GD topics for practice purpose
11. Interview Skills
 - i. Basics of interview skills
 - ii. Preparing yourself for the interview
 - iii. How to face interview board
 - iv. Ten worst interview blunders
 - v. Sample questionnaire and answers
12. Practice tests for IELTS and TOEFL
 - i. A blueprint of IELTS and TOEFL
 - ii. Most often asked questions in IELTS / TOEFL
13. Reflection of Perfection
 - i. Value of being perfect
 - ii. A short inspiring story on the importance of perfection
14. Key to Success
 - i. Formula for Success
 - ii. Ten steps for Transformation
 - iii. Tips to learn English Grammar and Spoken English

TEXT BOOKS :

1. English Lab for B.Pharmacy Students by **Anthony**
2. Interview and Group discussion skills with mind blowing questions and top class logical answers by **Anthony & Srinivas**
3. English grammar and composition by **Wren & Martin**

II/IV B.PHARMACY (4th SEMESTER)
MODEL QUESTION PAPER

English & Communication Skills (Language Lab)

Time : 3 hours

Max.Marks : 70

01. Write all the rules and regulations of Direct speech and indirect (5M)
speech.
02. Write About Pronoun (5M)
03. Choose the correct word from the pair (5M)
- a. The movie was (so/such) boring she fell a sleep
 - b. She (lie/lay) down for a short nap
 - c. She should be arriving (shortly/briefly)
 - d. She (laid/lay) the book on the table.
 - e. You can choose from (among/between) five prizes.
04. Choose the correct form of the verb. (5M)
- a. I would like _____ the President of our country
To meet/meet/meeting
 - b. Shall I _____off the TV ?
Turn / Turning / to turn
 - c. You didn't need _____any more eggs.
Buy / to buy / buying
 - d. Could I _____ your dictionary, please ?
To borrow / Borrow / Borrowing
 - e. Do we have _____now ?
To leave / Leaving / Leave
05. Essay writing - "Global warming" ? (10M)
06. Extempore (10M)
07. Language laboratory online exercises in Language laboratory (30M)

A.N.U. B.PHARMACY SYLLABUS (WITH EFFECT FROM 2012 - 13 ACADEMIC YEAR)

Course No.	SUBJECT	Periods per week		Exam. Duration (hrs)	Marks		TOTAL
		Theory	Practical		Sessional	Semester end	
III/IV B.PHARMACY 5th SEMESTER							
501	Pharmaceutical Chemistry-IV Medicinal-II) (Theory)	6	---	3	30	70	100
502	Pharmaceutical Chemistry-IV (Medicinal-II) Practicals	---	6	6	30	70	100
503	Pharmaceutics-II (Dosage form Technology Including Cosmetics) (Theory)	6	---	3	30	70	100
504	Pharmaceutics-II (Dosage form Technology Including Cosmetics) Practicals	---	6	6	30	70	100
505	Pharmacognosy-I (Theory)	6	---	3	30	70	100
506	Pharmacognosy-I (Practicals)	---	6	6	30	70	100
507	Pharmacology-I (Theory)	6	---	3	30	70	100
	Total	24	18	30	210	490	700
III/IV B.PHARMACY 6th SEMESTER							
601	Pharmaceutical Engineering - II (Theory)	6	---	3	30	70	100
602	Pharmaceutical Engineering-II (Practicals)	---	6	6	30	70	100
603	Pharmaceutical Biotechnology (Theory)	6	---	3	30	70	100
604	Pharmaceutical Biotechnology (Practicals)	---	6	6	30	70	100
605	Hospital and Clinical Pharmacy (Theory)	6	---	3	30	70	100
606	Hospital and Clinical Pharmacy (Practicals)	---	6	6	30	70	100
607	Seminar	6	---	---	---	---	---
	Total :	24	18	27	180	420	600

III/IV B.PHARMACY (5th Semester)
501 PHARMACEUTICAL CHEMISTRY-IV (MEDICINAL-II)
(Theory) (75 hrs.)

Unit : 01

Quantitative structure activity relationship (QSAR) studies, basic concepts of computer aided drug design, different drug design approaches, basic concepts of combinatorial synthesis.

Unit : 02

General Anaesthetics : Introduction, classification, mechanism of action, synthesis and therapeutic uses of halothane, ketamine, methohexital.

Local Anaesthetics : Introduction, chemical classification, ideal requirements, mode of action, SAR, structures of important local anaesthetics, metabolism and synthesis of benzocaine, procaine, lidocaine, tetracaine and cinchocaine.

Hypnotics and Sedatives – SAR of barbiturates, synthesis, metabolism and therapeutic uses of phenobarbital, amylobarbitol, pentobarbital, cyclobarbitone calcium, thiopental, hexobarbital. chlordiazepoxide, diazepam, alprazolam.

Anti-psychotics – SAR of phenothiazines, synthesis and therapeutic uses of promethazine, Prochlorperazine, Fluphenazine, chlorpromazine, haloperidol, clozapine, oxypentine.

Anti-depressants: Synthesis and therapeutic uses of amitriptyline, doxepine, iproniazid, isocarboxizide, trazodone, fluoxetine

Anti - Anxiety agents : Synthesis and therapeutic uses of nitrazepam, lorazepam, prazepam

Anti-epileptics – Synthesis and therapeutic uses of phenytoin, valproic acid, carbamazepine, ethosuximide.

Unit : 03

Drugs affecting adrenergic mechanism : Adrenergic receptors, biosynthesis of catecholamines, chemical classification along with structures, S.A.R of adrenergic drugs, adrenergic agonists, adrenergic blockers. Synthesis and therapeutic uses of phenylephrine, ephedrine, naphazoline, terbutaline, dopamine, amphetamine, phenoxybenzamine, propranolol, metoprolol, atenolol, tolazoline.

Drugs affecting cholinergic mechanism: Introduction, SAR, cholinergic receptors, study of cholinergic agonists, indirectly acting cholinergic agonists, cholinergic blocking agents, neuromuscular blocking agents. Synthesis and therapeutic uses of methacholine, carbachol, neostigmine, pralidoxime, propantheline, dicyclamine, tropicamide, atropine, bipyridine.

Unit : 04

Cardiovascular Agents: Introduction, classification, mechanism of action of antianginal agents, calcium channel blockers, Anti-arrhythmic drugs, antihypertensive agents, antihyperlipidemic agents and anticoagulants. Synthesis and therapeutic uses of methyldopa, amlodipine, clonidine, hydralazine, verapamil, clofibrate, dicoumorol, warfarin

Hypoglycaemics : General account on pancreatic malfunctions. chemical classification, S.A.R of hypoglycemics, Insulin preparations, a brief account on statin antidiabetics – phenformin, glipizide, chlopropamide, including a brief account on PPAR γ inhibitors, meglitinide analogues, α -glucosidase inhibitors–Acarbose, miglitol. A brief account on thyroid and antithyroid drugs.

Unit : 05

Opioid Analgesics : Classification along with structures, mechanism of action, S.A.R of opioid analgesics, mixed agonists and mixed antagonists, central and peripheral acting anti tussive agents. Structure and therapeutic uses of morphine, codeine, diacetylmorphine, nalorphine, levallorphan, noscapine, dextromethorphan.

NSAIDS (Non-steroidal anti-inflammatory agents) : Introduction and types of pain and inflammation. Synthesis, metabolism and therapeutic uses of aspirin, paracetamol, ibuprofen, mefenamic acid, diclofenac, piroxicam. A brief account on Cox-2 inhibitors.

Unit : 06

DIURETICS : Introduction, chemical classification along with structures, mechanism of action, S.A.R, metabolism and synthesis of acetazolamide, benzthiazide, furosemide, ethacrynic acid chlorthiazide, hydrochlorthiazide and amiloride.

Antihistaminic agents : Introduction, histamine receptors, biosynthesis of histamine, study of H1 and H2 antagonists. Chemical classification along with structures, mechanism of action, S.A.R, of antihistamines. Synthesis and metabolism of diphenhydramine, pyrilamine, mepyramine, cyclizine pheninramine, promethazine, antazoline, astemizole, cetirizine, cimetidine.

Diagnostic agents : Introduction, structures and therapeutic uses of some important organic compounds as diagnostic agents. Synthesis of iopanoic acid, fluorescein, diatriazoic acid and metyrapone

III/IV B.PHARMACY (5th Semester)
502 PHARMACEUTICAL CHEMISTRY-IV
(MEDICINAL-II) (Practicals) (75 hrs.)

- 01*. Assay of indomethacin capsules – I.P.
- 02*. Assay of glipizide/frusemide tablets – I.P.
- 03*. Assay of ibuprofen suspension – I.P.
- 04*. Assay of paracetamol elixir/tablet – I.P.
05. Assay of ascorbic acid tablets – I.P.
- 06*. Assay of salicylic acid ointment – I.P.
- 07*. Assay of aminophylline injection - I.P.
08. Assay of metronidazole tablets – I.P.
- 09*. Synthesis of benzil from benzoin
10. Synthesis of benzillic acid from benzil
11. Synthesis of 7-hydroxy 4-methyl coumarin
12. Synthesis of benzimidazole
- 13*. Synthesis of benzocaine
- 14*. Synthesis of benzotriazole
15. Synthesis of aspirin
- 16*. Synthesis of phenytoin (5, 5' – diphenyl hydantoin)
17. Synthesis of sulphanilamide.

TEST BOOKS

1. Text book of Medicinal Chemistry by William O. Foye, Lea Febiger, Philadelphia. Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry by JH Block & JM Beale (Eds), 11th Ed, Lippcott, Raven, Philadelphia, 2004.
2. D. Abraham (Ed), Burger Medicinal chemistry and Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003, 6th Ed.
3. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences; 20th Edition.
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry Ed: I. M. Atherden. Oxford University Press, Delhi.
5. B.N. Lads, MG.Mandel and F.I. way, Fundamentals of drug metabolism & disposition, William & welking co, Baltimore USA.
6. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, Oxford
7. Rama Rao Nadendla, Principles of Organic Medicinal chemistry, Vol-I, New-Age International Publishers Pvt., limited, New Delhi, 2005
8. Daniel lednicer, Strategies For Organic Drug Synthesis And Design, John Wiley, N. Y. 1998.
9. D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y.

III/IV B.PHARMACY (5th Semester)

MODEL QUESTION PAPER

501 PHARMACEUTICAL CHEMISTRY-IV (MEDICINAL-II) (Theory)

Time : 3 hours

Max.Marks : 70

SECTION-A

Answer any four questions (4 X 10 = 40 marks)

1. Add a note on different drug design approaches. Give a detailed account of computer aided drug design.
2. Classify sedatives and hypnotics with suitable examples. Write the SAR and mode of action of Barbiturates.
3. Outline the chemical classification of adrenergic drugs. Discuss their mode of action and SAR.
4. What are oral hypoglycemic agents ? Classify them with examples and write their mode of action.
5. Classify the non-steroidal anti inflammatory agents with examples and discuss their mode of action ? How do you synthesize diclofenac and piroxicom ?
6. Classify H1 antagonists with examples ? Discuss the SAR and mechanism of action of these drugs.

SECTION - B

Answer any TEN questions (10 X 3 = 30 marks)

7. Write short notes on Free Wilson analysis
8. Short notes on descriptors used in QSAR
9. Outline the synthesis and therapeutic uses of phenytoin.
10. Mechanism of action of MAO inhibitors.
11. Short notes on cholinergic receptors.
12. Give the synthesis and mechanism of propantheline.
13. Write short notes on antianginal agents.
14. Outline the synthesis of clonidine
15. Discuss the mode of action of opioid analgesics
16. Short notes on opioid antagonists
17. Write the SAR and mode of action of thiazide diuretics.
18. Add a note on synthesis and metabolism of cetirizine.

III/IV B.PHARMACY (5th Semester)

MODEL QUESTION PAPER (Practicals)

502 PHARMACEUTICAL CHEMISTRY-IV (MEDICINAL-II)

Time : 4 hours

Max.Marks : 70

- | | | |
|----------------------|---|----------|
| 1. Synopsis | : | 10 Marks |
| 2*. Major Experiment | : | 30 Marks |
| 3. Minor Experiment | : | 20 Marks |
| 4. Viva-Voce | : | 10 Marks |

Total: 70 Marks

III/IV B.PHARMACY (5th Semester)

503 PHARMACEUTICS-II

(DOSAGE FORM TECHNOLOGY INCLUDING COSMETICS)

(Theory) (75 hrs.)

UNIT : 01

Formulation : Physical chemical and therapeutic factors in-volved in the formulation of dosage forms. Introduction to pre-formulation studies. Formulation additives in solid, semi-solid and parenteral dosage forms.

UNIT : 02

A study of the principles, formulation, manufacturing process and equipment and quality control of the following dosage forms.

Liquid orals - Manufacture and quality control of solutions, emulsions and suspensions.

Semi-solids : Ointments, creams, pastes, Jellies - Definitions, Ideal requirements, Types of bases, selection of base, Typical examples.

UNIT : 03

A study of the principles, formulation, manufacturing process and equipment and quality control of the following dosage forms.

Solids: Compressed tablets Types - Formulation additives, Formulation, manufacture and quality control of tablets -Examples (I.P.) Processing problems.

Capsules : Hard and soft: Formulation, manufacture and their quality control.

Tablet coating: Purpose - Sugar, film and enteric coating methods.

UNIT : 04

Parenterals : Definitions, Types, Formulation aspects, production facilities, lay out, manufacturing and quality control, Typical examples from I.P.

Ophthalmic preparations : Eye ointments, Eye drops, Ideal requirements, Formulation, manufacture and quality control, Typical examples from I.P.

UNIT : 05

Pharmaceutical Aerosols: Definitions, classification - formulation, propellents, pressurized packagings, applications

Radiopharmaceuticals: Therapeutic and diagnostic uses. Production of radio Pharmaceuticals - Care in handling.

UNIT : 06

Cosmetics: A Study of formulation manufacture and evaluation of cleaning creams, nail lacquers and nail polish removers, deodorants and antiperspirants, shampoos, hair bleaches and depilatories, shaving creams.

504 PHARMACEUTICS – II
(DOSAGE FORM TECHNOLOGY INCLUDING COSMETICS)
(Practicals) (75 hrs.)

- 01*. Formulation of an anti-pyretic liquid oral for a child below ten years.
02. Formulation of paediatric liquid oral of ibuprofen
03. Formulation of paediatric liquid oral of amoxicillin
04. Formulation of an antacid liquid oral
- 05*. Manufacture of dummy lactose tablets
06. Quality control tests of dummy lactose tablets
- 07*. Manufacture of calcium phosphate tablets
08. Manufacture of chewable antacid tablets
- 09*. Manufacture of ibuprofen-tablets by direct compression.
10. Manufacture of aqueous cream base
- 11*. Formulation of piroxicam capsules.
12. Quality control tests for capsules.
13. Manufacture of sodium alginate jelly
14. Manufacture of piroxicam jelly
15. Manufacture of sodium CMC lubricating jelly
16. Manufacture of dextrose ampoules by terminal sterilization.
17. Manufacture of NaNO_3 ampoules by terminal sterilization.
18. Disintegration test for different types of tablets.
- 19*. Dissolution test for tablets.
20. Formulation and evaluation of antidandruff shampoo.

TEXT BOOKS :

01. Theory and Practice of Industrial Pharmacy by Lachman
02. Bentley's Text Book of Pharmaceutics
03. Remington's Pharmaceutical Sciences
04. Pharmaceutical Dosage Forms – Tablets by H.A.Lieberman
05. Modern pharmaceutics by Banker
06. Pharmaceutics by Aulton
07. Encyclopedia of Pharmaceutical technology by Swarbrick
08. Cosmetic science and technology by Sagarin
09. Cosmetics - Manufacture, Formulation and Quality control - P.K.Sharma.

III/IV B.PHARMACY (5th Semester)

MODEL QUESTION PAPER

503 PHARMACEUTICS-II (Theory)

(DOSAGE FORM TECHNOLOGY INCLUDING COSMETICS)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. Discuss the physico-chemical factors involved in the preformulation of solid dosage forms.
2. What are the ideal requirements of ointment bases ? Classify ointment bases with examples.
3. What are different methods used in manufacture of tablets ? Explain about wet granulation process.
4. Describe the facilities for commercial production of parenterals with neat layout
5. What are the advantages of aerosols. With a neat sketch. Explain the metering valve for pharmaceutical aerosols.
6. Classify shampoos. Write down the ideal requirements of shampoos.

SECTION - B

Answer any TEN questions (10 X 3 = 30 marks)

7. Write a note on additives used in tablet dosage forms.
8. Explain the significance of the preformulation studies.
9. Write a note on controlled flocculation.
10. Explain the evaluation tests for emulsions.
11. Explain about sugar coating.
12. Explain about Softgels
13. Write a note on ophthalmic preservatives.
14. Write any 2 evaluation tests for parenterals.
15. Explain about handling of Radio pharmaceuticals.
16. Write a note on evaluation tests for aerosols.
17. Write a short notes on depilatories.
18. Write a short notes on formulation of nail polish removers.

III/IV B.PHARMACY (5th Semester)

MODEL QUESTION PAPER (Practicals)

504 PHARMACEUTICS-II

(DOSAGE FORM TECHNOLOGY INCLUDING COSMETICS)

Time : 6 hours

Max.Marks : 70

- | | | |
|----------------------|---|----------|
| 1. Synopsis | : | 10 Marks |
| 2*. Major Experiment | : | 30 Marks |
| 3. Minor Experiment | : | 20 Marks |
| 4. Viva-Voce | : | 10 Marks |
| | | ----- |
| Total: | | 70 Marks |
| | | ----- |

III/IV B.PHARMACY (5th Semester)
505 PHARMACOGNOSY-1 (Theory) (75 hrs.)

Unit : 01

Definitions, history, scope and development of pharmacognosy. Sources of natural drugs, organized and unorganized drugs. Different methods of classification of crude drugs.

Unit : 02

Cultivation, collection, processing and storage of crude drugs. Factors influencing cultivation of medicinal plants. Types of soils and fertilizers of common use. Pest management and natural pest control agents. Plant hormones and their application. Polyploidy, mutation and hybridization with reference to medicinal plants.

Unit : 03

Quality control of crude drugs : Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation.

Unit : 04

Systematic pharmacognostic study (microscopical characters, varieties, adulterants, substituents, principle constituents and uses) of the following

- 1. Carbohydrates and derived products :** Agar, guar gum, gum acacia, honey, isabgol, pectin, starch, sterculia and tragacanth
- 2. Proteins and enzymes:** Gelatin, papain, yeast.
- 3. Tannins:** Arjuna, black catechu, gambier catechu.

Unit : 05

Study of fibres used in pharmacy such as asbestos, cotton, glass- wool, nylon, polyester, silk and wool.

Resin and Resin combinations : Asafoetida, balsam of peru, balsam of tolu, benzoin, cannabis, capsicum, ginger, guggel, jalap, myrrh, podophyllum, storax, turmeric.

Unit : 06

An introduction to biogenesis of primary and secondary metabolites of pharmaceutical importance

III/IV B.PHARMACY (5th Semester)

506 PHARMACOGNOSY – I (Practicals) (75 hrs.)

01. Identification of Carbohydrates (Agar, Acacia, Starch, Honey, Tragacanth, Guar gum, Pectin, Isabgol), Tannins (Black catechu), Resins (Benzoin, Asafoetida, storax, myrrh), Fibres (absorbent cotton, non-absorbent cotton, silk and wool) by general and specific chemical tests.
02. **Cellular Structures :**
 - i. Measurement of length and width of phloem fibres in powdered crude drugs, (Cinchona & Cinnamon)
 - ii. Measurement of starch grains (Ginger and Potatostarch)
 - iii. Measurement of calcium oxalate crystals (squill)
03. **Determination of Leaf constants**
 - i*. Determination of stomatal number and stomatal index (Datura and Senna)
 - ii*. Determination of veinislet number
 - ii. Determination of swelling factor of the given seeds (Isabgol)
 - iv. Determination of ash value.
 - v*. Determination of Palisade ratio
04. **Identification of crude drug by organoleptic and morphological characters :** Fibres (Cotton, Wool, Silk), Carbohydrates (Agar, Isapgol, acacia, tragacanth, Honey) , Proteins & Enzymes (Yeast), Tannins (Black catechu, Arjuna), Resins (Benzoin, Myrrh, Asafoetida, Turmeric, Ginger, Jalap, Podophylum.)
05. Determination of extractive value of crude drug
06. Extraction of eucalyptus oil

TEXT BOOKS :

01. Text book of Pharmacognosy by T.E.Wallis.
02. Text book of Pharmacognosy by Trease and Evans
03. Text book of Pharmacognosy by C.K.Kokate
04. Cultivation of Medicinal and Aromatic crops by A A Farooqui and B.S.Sree ramu
05. Pharmacognosy and Phytochemistry by Dr.Vinod Rangari,
06. Pharmacognosy and phytochemistry by Ashutoshkar.
07. Essentials of Pharmacognosy by Dr.S.H.Ansari.
08. Pharmacognosy and phytochemistry by Brady & Talyr
09. Text book of Pharmacognosy by S.S.Handa and V.K.Kapoor.

III/IV B.PHARMACY (5th Semester)

MODEL QUESTION PAPER

505 PHARMACOGNOSY - I (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. Define crude drug and write the differences between organized and unorganized crude drugs.
2. Write in detail about endogeneous factors affecting cultivation of medicinal and aromatic plants.
3. Enumerate the physical methods of crude drug evaluation.
4. Write the systematic pharmacognostic study of gum acacia.
5. Write the applications of pharmaceutical fibres.
6. Give an account of biosynthetic pathways for the formation of important alkaloids.

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. Write in brief about various sources of crude drugs.
8. Write the chemical classification of crude drugs.
9. Discuss the importance of sort and soil fertility in the cultivation of medicinal and aromatic plants.
10. Classify plant hormones and write the applications of gibberellins in cultivation technology.
11. Enumerate the methods of crude drug adulteration with examples.
12. What is micrometry and write its significance in the evaluation of crude drugs.
13. Define carbohydrates, write the biological source and uses of tragacanth
14. Write the chemical constituents and uses of gelatin and arjuna.
15. Differentiate wool and silk
16. Method of preparation of surgical cotton.
17. Explain the biosynthesis of indole alkaloids.
18. Write the biological source and chemical constituents of storax and asafoetida.

III/IV B.PHARMACY (5th Semester)

MODEL QUESTION PAPER (Practicals)

506 PHARMACOGNOSY-I

Time : 6 hours

Max.Marks : 70

- | | | |
|----------------------|---|----------|
| 1. Synopsis | : | 10 Marks |
| 2*. Major Experiment | : | 30 Marks |
| 3. Minor Experiment | : | 20 Marks |
| 4. Viva-Voce | : | 10 Marks |

Total: 70 Marks

III/IV B.PHARMACY (5th Semester)
507 PHARMACOLOGY-I (Theory) (75 hrs.)

Unit : 01

General Pharmacology and pharmacodynamics : Factors influencing the effect of drugs. The Dose –effect relationship, Introduction to LD₅₀ and ED₅₀, therapeutic index. General mechanism of drug action, Structure activity relationship, drug receptors, drug toxicity and drug allergy.

Unit : 02

Pharmacology of drugs acting on autonomic nervous system:

Parasympathomimetics, parasympatholytics, sympathomimetics, sympatholytics, neuromuscular blocking agents and ganglionic blockers.

Unit : 03

Pharmacology of drugs acting on central nervous system : Synaptic transmission in the CNS; General anaesthetics, hypno-sedatives, analgesics, antipyretics and anti-Inflammatory agents.

Unit : 04

Pharmacology of drugs acting on central Nervous system :

Antiepileptics, antiparkinsonian drugs, psycho- pharmacological agents, CNS stimulants, hallucinogens and drugs used in gout

Unit : 05

Pharmacology of drugs acting on Gastro –intestinal system : Purgatives, Antidiarrhoeal drugs, treatment of peptic ulcer, emetics and anti- emetics.

Unit : 06

Pharmacology of local anaesthetics and diuretics.

TEXT BOOKS :

01. Goodman and Gilman - The Pharmacological Basis of Therapeutics.
02. Textbook of Pharmacology by Rang and Dale
03. Quientessence of Medical Pharmacology by C.Chowdary.
04. Lippincott's illustrated reviews - Pharmacology by Richard D.Howland and Mery J.Mylek.
05. Essentials of medical pharmacology by K.D.Tripathi.
06. Pharmacology and Pharmacotherapeutics by R.S.Satoskar, S.D.Bhanderkar and S.S.Ainapure.

III/IV B.PHARMACY (5th Semester)
MODEL QUESTION PAPER
507 PHARMACOLOGY-I (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. Discuss the mechanisms of drug action with suitable examples.
2. Classify cholinesterase inhibitors with suitable examples and discuss about the management of organophosphorous poisoning.
3. Classify the anti inflammatory drugs with suitable examples and discuss the pharmacology of salicylates.
4. Classify antidepressants. How do tricyclic antidepressants act ? Write their clinical usefulness.
5. Classify and discuss the various drugs that are used in peptic ulcer. Add a note on proton-pump inhibitors.
6. Classify diuretics with suitable examples and discuss the mechanism of action and adverse effects of furosemide ?

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. Describe briefly dose-effect relationship.
8. Explain antagonism with examples.
9. Write short notes on neuromuscular blocking drugs.
10. Discuss the mechanism of action and therapeutic uses of adrenaline.
11. Write notes on benzodiazepines.
12. Add a note on endogenous opioid peptides.
13. Write short notes on L-Dopa.
14. Describe the mechanism of action and mention the therapeutic uses and toxicities of phenytoin.
15. Add a note on emetics.
16. Write notes on pharmacology of allopurinol .
17. Describe the mechanism of action and therapeutic uses of cocaine.
18. Discuss different routes of administration of local anesthetics.

III/IV B.PHARMACY (6th Semester)
601 PHARMACEUTICAL ENGINEERING-II
(Theory) (75 hrs.)

Unit : 01

Flow of heat:- Concept of heat flow : Conduction through single wall, layers in series and cylinders. Natural and forced convection, temperature gradient in forced convection, concept of surface coefficient, dimensional analysis to compute surface coefficient, boiling liquids, condensing vapours, temperature drop in parallel and counter-current heat exchangers, radiation, Stefan - Boltzmann law. Construction, operation and application of heat exchangers, interchangers and finned tubes .

Unit : 02

Evaporation : Theory of evaporation, heat and material balance; evaporator types : Steam jacketted kettle , horizontal, vertical tube evaporator, forced circulation evaporators, falling film and climbing film evaporators and agitated film evaporation. Capacity of multiple effect evaporators.

Unit : 03

Drying : Theory of drying , drying curves shrinkage of materials, construction , operation and application of different dryers, atmospheric and vacuum compartment dryer, rotary dryer, agitator dryer, spray dryer, freeze dryer, fluidized bed dryer.

Unit : 04

Distillation : Theory of distillation of binary miscible, immiscible mixtures . Theory of rectification, azeotropic distillation, steam distillation, simple distillation, extractive and fractional distillation, and molecular distillation design of equipment for different distillation methods.

Unit : 05

Crystallization : Mier's Theory, its limitations ,crystal growth , nucleation, caking of crystals, material and energy balances in crystallization. Construction, operation and application of batch crystallizers, agitated tank crystallizers, Swenson -walker crystallizer, Krystal crystallizer and vacuum crystallizers .

Unit : 06

Filtration : Theory of filtration , filter media construction and operation of filter press, metafilter, disk filter, rotary filter. Centrifuges - Theory, equipment and applications.

Extraction : Theory of extraction, flow diagram of oil- seed extraction equipment, Podbielniak extractor, counter current extraction, leaching of solids and equipment .

III/IV B.PHARMACY (6th Semester)
602 PHARMACEUTICAL ENGINEERING – II
(Practicals) (75 hrs.)

Part - A Study of the following equipments

01. Ball mill
02. Fluid energy mill
03. Colloid mill
04. Planetary mixer
05. Plate and frame filter press
06. Rotatory drum filters
07. Film evaporators
08. Multi effect evaporator
09. Spray drier
10. Fluid bed dryer
11. Freeze drying
12. Swenson-walker crystallizer
13. Recirculation magma crystallizer
14. Podbielniak extract

Part - B

01. Determination of humidity of air
02. Determination of humidity of air by dew-point method
- 03*. Size separation by sieving method
- 04*. Size reduction by ball mill
05. Determination of moisture content by IR moisture balance
06. Effect of filter aid concentration on rate of filtration
07. Factors affecting rate of filtration
- 08*. Determination of efficiency of steam distillation
- 09*. Determination of radiation constant of unpainted glass
- 10*. Determination of radiation constant in iron.
- 11*. Determination of radiation constant of painted glass
12. Size reduction by disintegration mill.
13. Determination of over all heat transfer coefficient.
- 14*. Determination of drying rate curve for calcium carbonate
- 15*. Determination of drying rate curve for sand
16. Crystallisation.

TEXT BOOKS :

01. Introduction to chemical Engineering by Badger
02. Text Book of Pharmaceutical Engineering by K.Samba Murthy
03. Perry's Chemical Engineers Hand Book.
04. Pharmaceutical Engineering by C.V.S.Subrahmanyam
05. Bentley's Text book of Pharmaceutics.

III/IV B.PHARMACY (6th Semester)

MODEL QUESTION PAPER

601 PHARMACEUTICAL ENGINEERING - II (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. Describe multipass heater along with its advantages over single pass heater.
2. Give the design and working of vertical tube and climbing film evaporator
3. Give the design and operation of a fluidised bed dryer
4. Discuss the azeotropic distillation and molecular distillation.
5. Discuss the design, principle and working of swensen-walker crystallizer and krystal onstallizer.
6. Describe the construction, working and applications of a filter for use as a continuous type.

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. What are finned tubes ?
8. What is fourier's law and thermal conductivity ?
9. Write briefly on scale formation.
10. Write the theory of evaporation.
11. What is the principle involved in the freeze drying ?
12. Give the applications of spray dryer
13. What is mean free path ? Write its importance.
14. Give the types of fractionating column used in fractional distillation.
15. What is mier's supersaturation theory ? Write its limitations.
16. Write the factors influencing crystallization.
17. Write briefly on disc filters
18. Write the principle involved in filtration technique.

III/IV B.PHARMACY (6th Semester)

MODEL QUESTION PAPER (Practicals)

602 PHARMACEUTICAL ENGINEERING-II

Time : 6 hours

Max.Marks : 70

1. Synopsis	:	10 Marks
2*. Major Experiment	:	30 Marks
3. Minor Experiment	:	20 Marks
4. Viva-Voce	:	10 Marks

Total:		70 Marks

III/IV B.PHARMACY (6th Semester)
603 PHARMACEUTICAL BIOTECHNOLOGY
(Theory) (75 hrs.)

Unit : 01

Fermentation Products :

- i. Screening methods for bioactive metabolites
- ii. Introduction to fermenter and its accessories,
- iii. Manufacture of the following : study of media , conditions, extraction and purification of
 - a) Antibiotics- Pencillin and streptomycin
 - b) Acids- Citric acid and lactic Acid
 - c) Solvents - Alcohol
 - d) Enzymes - Fungal diastase
 - e) Vitamins- Vitamin B12
 - f) Miscellaneous - Dextran and lactobacillus

Unit : 02

Test for sterility : Sterility testing , media , sampling, neutralisation of various antimicrobial substances in dosage forms. Surgical dressings, sutures and ligatures and their standards, sterilization and test for sterility.

Unit : 03

Animal products : Extraction and purification of insulin, pancreatin, pepsin, heparin and liver preparations. Blood products and plasma substitutes of I.P

Immunological Products : Manufacture of vaccines, sera, anti-toxins and diagnostic agents official in I.P

Unit : 04

Principles of Microbiological assay of vitamin-B₁₂, penicillin, streptomycin and tetracyclines. Radio Immunoassay - Principles , estimation of insulin in blood serum

Unit : 05

Microbial conversion of steroids, Enzyme immobilization : Methods of enzyme immobilization, factors affecting enzyme kinetics, study of streptokinase, penicillinase, amylase and immobilization of bacterial cells.

Unit : 06

An introduction to Recombinant DNA technology : Brief knowledge about the making of human Insulin, Interferons, monoclonal antibodies, synthetic vaccines and streptokinase.

III/IV B.PHARMACY (6th Semester)
604 PHARMACEUTICAL BIOTECHNOLOGY
(Practicals) (75 hrs.)

01. Nitrate reduction test
02. Hydrogen sulphide production test
03. Study of growth of stationary and rotary shake flask cultures
04. Efficiency of laminar air flow unit
05. Effect of salt concentration on the growth of micro Organisms
06. Effect of PH on growth of micro organisms
07. Indole production test
08. Citrate utilization test
09. Test for sterility of sterile water for injection.
10. Test for sterility of bentonite powder
11. Test for sterility of talcum powder
12. Microbiological assay of tifampicin
- 13*. Microbiological assay of streptomycin
14. Catalase production test
- 15*. Microbiological assay of benzyl pencillin
16. Effect of temperature on the growth of micro Organisms
17. Microbiological assay of oxytetracycline
18. Microbial testing of sterile and non sterile products
19. Microbiological assay of benzyl pencillin by cup-plate method

TEXT BOOKS :

01. Industrial microbiology by Casida.
02. Industrial microbiology by Miller
03. Industrial microbiology by Prescott and Dunn.
04. I.P./B.P.
05. Tutorial Pharmacy by Cooper and Gunn.
06. Bentley's Pharmaceutics
07. Principles of Fermentation technology by P.F.Stanbury

III/IV B.PHARMACY (6th Semester)
MODEL QUESTION PAPER
603 PHARMACEUTICAL BIOTECHNOLOGY

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. Define fermentation ? Explain the design and operation of fermentor with a neat sketch ? Add a note on significance of impellers, spargers and Baffles.
2. What is sterility testing ? Describe various steps involved in sterility testing. What is repeat testing ?
3. What are vaccines and seras ? Classify various types of vaccines ? Explain the preparation, standardisation, labelling and storage of BCG vaccine ?
4. Explain the principle and procedure for estimation of Insulin by Radio immuno Assay ?
5. Explain the term immobilization ? Describe the different methods of enzyme immobilization. What are its advantages and disadvantages ?
6. Define R-DNA technology ? Describe the production of synthetic vaccine Hepatitis-B by R-DNA technology.

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. Write short notes on bioauto graphy ?
8. Discuss the production of dextran with a flow diagram ?
9. Give a brief account on surgical catgut ?
10. Give a brief note on sampling methods of sterility testing ?
11. Give a brief note on extraction and purification of Heparin ?
12. Give a short notes on Dried Human Plasma ?
13. Discuss briefly about vitamin-B₁₂ Microbial assay ?
14. Write the principle involved in Microbiological assay ?
15. Write the study of enzyme immobilisation of streptokinase.
16. Write the short notes on microbial conversion of steriods.
17. Write the principle involved in production and screening of Monoclonal antibodies.
18. Explain in brief about the recombinant production of interferons.

III/IV B.PHARMACY (6th Semester)
MODEL QUESTION PAPER (Practicals)
604 PHARMACEUTICAL BIO-TECHNOLOGY

Time : 6 hours

Max.Marks : 70

- | | | |
|----------------------|---|----------|
| 1. Synopsis | : | 10 Marks |
| 2*. Major Experiment | : | 30 Marks |
| 3. Minor Experiment | : | 20 Marks |
| 4. Viva-Voce | : | 10 Marks |

Total: 70 Marks

:: 116 ::

III/IV B.PHARMACY (6th Semester)
605 HOSPITAL AND CLINICAL PHARMACY
(Theory) (75 hrs.)

UNIT: 01

Hospital pharmacy: Organization, personnel, location, space and equipment, Responsibilities of a hospital pharmacist, Pharmacy and therapeutic committee-Purpose, organization and Functions, Hospital Formulary: Contents, preparation and revision of hospital formulary, Drug distribution Systems in Hospitals: (a) Out-patient dispensing methods (b) In-patient dispensing methods. Dispensing of controlled drugs.

UNIT: 02

Manufacture of Sterile Products: production and quality control in hospital pharmacy. Incompatibility: Physical, Chemical and therapeutic incompatibilities- Methods of over coming and handling of incompatible prescriptions.

UNIT: 03

Prescription: Definition, various part of prescription, Handling of prescription, source of errors in prescription, Posology: Definition, Latin terms, Factors affecting dose selection. Calculation of children and infant doses.

UNIT: 04

Introduction and scope of clinical pharmacy practice, Patient counselling, Medication history review, Drug information services Sources- Procurement, Retrieval and Computerization of Information, Poison Information and Services, Rational use of drugs & Essential drugs.

UNIT: 05

Drug Interactions-Classification, Mechanisms-with suitable examples. Adverse drug reactions, Teratogenicity, Drug induced diseases.

UNIT: 06

Clinical Pharmacy aspects of :

- a) Peptic ulcer, b) Angina Pectoris, c) Hypertension, d) Asthma,
- e) Tuberculosis, f) Diabetes, g) Acute renal failure, h) AIDS, I) Hepatitis
- j) Rheumatoid arthritis.

III/IV B.PHARMACY (6th Semester)
606 HOSPITAL AND CLINICAL PHARMACY
(Practicals) (75 hrs.)

01. General dispensing procedures
02. Study of Weights and measures
03. Preparation and dispensing of prescriptions of following classes of products : Powders, Mixtures, Ointments, Large Volume Parenterals.
04. Draw the layout and workflow patterns in the dispensary of a hospital.
05. Examine and report the drug distribution methods used in a hospital.

TEXT BOOK :

01. Cooper and Gun-Dispensing for Pharmaceutical Student
02. Hospital Pharmacy by William.E.Hassan
03. Clinical Pharmacy by Tipnis Bajaj
04. Pharmacotherapeutics by Roger and Walker.

III/IV B.PHARMACY (6th Semester)
MODEL QUESTION PAPER
605 HOSPITAL AND CLINICAL PHARMACY

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. What is hospital pharmacy ? Explain about organization in a modern hospital and mention its functions ?
2. Enumerate various Drug distribution methods for inpatients and out patients ?
3. Explain about sterile supplies in the hospital ? Draw a neat sketch of parenterals layout in the hospital ?
4. Define clinical pharmacy ? Mention its functions ? Add a note on current status in India.
5. Define Drug interactions ? Classify different types of drug interactions ? Add a note on absorption mediated drug interactions
6. Elucidate the pathophysiology of diabetes ? Mention signs and symptoms and suggest a line of treatment ?

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

1. Write about pharmacy and therapeutic committee and mention its functions ?
2. Write a short notes on Hospital formulary ?
3. Explain about Pharmacy procedure manual ?
4. Explain the dispensing procedure of ancillary and controlled substances
5. Write about drug information centre and its functions in Hospital
6. Explain about drug charges for inpatients & out patients in the hospital
7. Write short notes on pharmaco-economics
8. Write concept of essential drugs
9. Write short notes on drug induced diseases
10. Explain about teratogenicity
11. Explain pathophysiology of Asthma
12. Explain pathophysiology of AIDS

III/IV B.PHARMACY (6th Semester)
MODEL QUESTION PAPER (Practicals)
605 HOSPITAL AND CLINICAL PHARMACY

Time : 6 hours

Max.Marks : 70

1. Synopsis	:	10 Marks
2*. Major Experiment	:	30 Marks
3. Minor Experiment	:	20 Marks
4. Viva-Voce	:	10 Marks

Total:		70 Marks

A.N.U. B.PHARMACY SYLLABUS (WITH EFFECT FROM 2012 - 13 ACADEMIC YEAR)

Course No.	SUBJECT	Periods per week		Exam. Duration (hrs)	Marks		TOTAL
		Theory	Practical		Sessional	Semester end	
IV/IV B.PHARMACY 7th SEMESTER							
701	Pharmaceutics - III (Biopharmaceutics, (Theory) Pharmacokinetics & New Drug Delivery Systems)	6	---	3	30	70	100
702	Pharmaceutics-III (Biopharmaceutics, Pharmacokinetics & New Drug Delivery Systems) (Practicals)	---	6	6	30	70	100
703	Pharmacology-II (Theory)	6	---	3	30	70	100
704	Pharmacology-II (Practicals)	---	6	6	30	70	100
705	Pharmaceutical Analysis-II (Theory)	6	---	3	30	70	100
706	Pharmaceutical Analysis-II (Practicals)	---	6	6	30	70	100
707	Industrial Management and Pharmaceutical Marketing (Theory)	4	---	3	30	70	100
708	Project	---	2	---	---	---	---
	Total	22	20	30	210	490	700
IV/IV B.PHARMACY 8th SEMESTER							
	Project (Contd.....)	---	6	---	---	---	100
801	Pharmaceutical Chemistry-V (Natural Products) (Theory)	6	---	3	30	70	100
802	Pharmaceutical Chemistry - V (Natural Products) (Practicals)	---	6	6	30	70	100
803	Pharmacognosy - II (Theory)	6	---	3	30	70	100
804	Pharmacognosy - II (Practicals)	---	6	6	30	70	100
805	Good Manufacturing Practices & Validation (Theory)	6	---	3	30	70	100
	Total :	18	18	21	150	350	600

IV/IV B.PHARMACY (7th Semester)
701 PHARMACEUTICS-III (Theory) (75 hrs.)

(BIOPHARMACEUTICS, PHARMACOKINETICS & NEW DRUG DELIVERY SYSTEMS)

UNIT : 01 Biopharmaceutics:

Introduction, Definitions, Fate of drug after ad-ministration, Blood level curves, Routes of drug administration, Drug absorption and dis-position. Significance in product formulation and development. Drug absorption-Structure of biological membrane, Drug transport mechanisms, Physico-chemical and biological factors in-volved in Drug absorption - Formulations and dosage form considerations in drug absorption.

Drug Dissolution : Mechanisms, Factors and Kinetics of dissolution. Dissolution rate – Significance and evaluation - Official methods.

UNIT : 02 Bioavailability: Concept and definitions, Fac-tors involved on Assessment and significance of Drug Distribution. Plasma protein binding and its implications – Enterohepatic cycling.

Drug Elimination : Drug metabolism, Path ways of drug metabolism ; Excretion - Excre-tion through urine, bile, faeces, lungs and skin -Mechanism of Renal excretion – Renal clearance.

UNIT : 03 Pharmacokinetics: Introduction - Compartment models - Study of the methods of estimation, significane of the following parameters: biological half-life, Apparent volume of distribution, renal clear-ance, total body clearance, Absorption rate, AUC - Mathematical expressions describing the variation in blood concentrations follow-ing I.V. and oral routes. Introduction to dos-age regimens.

UNIT : 04 Non-linear Pharmacokinetics: Non-linear Pharmacokinetics with special reference to one compartment model after IV drug administration, Michaelis-Menten equation. Detection of non linearity (Saturation Mechanism)

UNIT : 05

Basic concepts of sustained and controlled drug delivery systems. Terminology of sustained drug delivery system, controlled release systems, delayed release systems, repeat action systems and site specific systems. Advantages and Disadvantages of SR/CR release systems. Drug candidate selection for SR/CR dosage forms. Dosage calculations, Physico chemical and biological factors influencing the design of SR/CR dosage forms.

UNIT-06

a) **Classification of controlled drug delivery systems:** Design, fabrication, evaluation and applications of oral controlled drug delivery systems, Parenteral Controlled drug delivery systems. Transdermal drug delivery systems.

b) **Micro encapsulation:** Definition, objectives of microencapsulation. Materials used for microencapsulation, various approaches for the preparation of microcapsules, and application of microencapsulation.

702 PHARMACEUTICS-III (BIOPHARMACEUTICS,
PHARMACOKINETICS & NEW DRUG DELIVERY SYSTEMS)
(Practicals) (75 hrs.)

- 01*. Dissolution rate testing and analysis of data
- 02*. Effect of surfactant on the solubility and dissolution rate of salicylic acid
- 03*. Effect of diluents on dissolution rate of salicylic acid
- 04*. Effect of concentration of magnesium stearate on dissolution rate of salicylic acid.
05. Evaluation of drug release from semi solid dosage form
06. Relation ship between pH, solubility, partition coefficient and percent ionization of salicylic acid .
- 07*. Enhancement of dissolution rate by solid dispersion technique
- 08*. Evaluation of diltiazem hydrochloride conventional and sustained release marketed tablets.
- 09*. Evaluation of nifedipine conventional tablet & capsule
10. Evaluation of disintegration and dissolution rate of commercial tablets
11. Basic pharmacokinetic calculations
12. Determination of bioavailability of four brands of given drug
13. Determination of absorption rate constant by Wagner-Nelson method
14. Determination of K_E & biological half life from plasma concentration and urinary excretion data
15. Determination of absorption rate constant by method of residuals
16. Preparation of microcapsules of naproxen
17. Calculation of pharmacokinetic parameter as per one compartment model
18. Estimation of renal clearance of creatinine and glomerular filtration rate
19. Determination of construction of standard graph for the estimation of sulphamethoxazole in blood.
20. Determination of biological half-life of rifampicin by urinary excretion data

TEXT BOOKS :

01. Pharmacokinetics by Gibaldi
02. Biopharmaceuticals and Pharmacokinetics by R.E.Notari.
03. Pharmacokinetics by Ritschal
04. Modern Pharmaceutics by G.S.Banker
05. Applied Biopharmaceutics and Pharmacokinetics, Leon Shargel
06. Clinical Pharmacokinetics; Concepts and applications by T.Rowland and Tozer
07. Bioavailability and bioequivalence by Ganesan & Pal.
08. Dissolution , bioavailability and bioequivalence by Hamed M.Abdou.

MODEL QUESTION PAPER
701 PHARMACEUTICS - III
(BIOPHARMACEUTICS, PHARMACOKINETICS AND NOVEL DRUG DELIVERY SYSTEMS) (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any FOUR questions (4 x 10 = 40 marks)

1. Define Drug absorption ? Enumerate salient features of various drug transport mechanisms ? Explain about fick's first law of diffusion.
2. Define Bioavailability and Bioequivalence ? Explain about experimental protocol in determination of bioavailability ?
3. Elucidate any one method to calculate absorption rate constant for an extra vascular administration following one compartment model. Mention merits and demerits and derive expressions for C_{max} and t_{max} .
4. Explain about Michaelis - Menten's equation ? How do you estimate K_m and V_{max} after i.v. bolus administration of drug following non-linear kinetics.
5. Explain the Principle and factors involved in design of sustained release formulations ? How will you calculate the loading and maintenance doses for SR products.
6. Define liposomes ? Enumerate various methods to produce liposomes ? Add a note on applications.

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. Write about gastric emptying time ?
8. Explain pH partition theory and mention its limitation ?
9. Explain enterohepatic cycling ?
10. Explain mechanisms of Renal excretion ?
11. Explain significance and application of A.U.C., volume of distribution (V_d) and clearance.
12. Define dosage regimen ? Explain the significance of two parameters in designing dosage regimen ?
13. Define Non linearity and causes for non-linearity
14. Write about michael-Menten's equation ?
15. Explain about coaceration - phase separation mechanism
16. Write short notes on implants ?
17. Write short notes on niosomes ?
18. Write short notes on transdermal drug delivery system ?

MODEL QUESTION PAPER (Practicals)

702 PHARMACEUTICS-III
(BIOPHARMACEUTICS, PHARMACOKINETICS AND NOVEL DRUG DELIVERY SYSTEMS)

Time : 6 hours

Max.Marks : 70

- | | | |
|----------------------|---|----------|
| 1. Synopsis | : | 10 Marks |
| 2*. Major Experiment | : | 30 Marks |
| 3. Minor Experiment | : | 20 Marks |
| 4. Viva-Voce | : | 10 Marks |

Total: 70 Marks

:: 123 ::

IV/IV B.PHARMACY (7th Semester)
703 PHARMACOLOGY-II (Theory) (75 hrs.)

Unit : 01

Pharmacology of drugs acting on cardiovascular system : Cardiac glycosides, antihypertensive drugs, coronary dilators, antihyper-lipidemic drugs, antiarrhythmic drugs. Drugs acting on the blood and blood forming agents, coagulants, anticoagulants, haematinics : Iron, Vitamin-B₁₂ and folic acid.

Unit : 02

Pharmacology of drugs acting on Respiratory system : Bronchodilators, antitussives and expectorants.

Autocoids: Histamine-antihistaminics, serotonin, serotoninantagonists, prostaglandins.

Unit : 03

Chemotherapy : General principles – Sulphonamides, antibiotics, antiprotozoal drugs, antimalarials, antiamoebic, antifungal and antiviral drugs, chemotherapy of tuberculosis, leprosy and cancer.

Unit : 04

Pharmacology of drugs acting on endocrine system : Thyroid, anti-thyroid drugs, insulin and oral hypoglycemics, glucagon, adrenocortical steroids, pituitary hormones, sex hormones and oral contraceptives.

Unit : 05

Bioassays : General principles of bioassays, Estimation of errors in bioassays. Study of the official biological assay methods of adrenaline, posterior pituitary hormones, insulin, gonadotrophic hormones, test for pyrogens.

Unit : 06

Principles of Toxicology : Poisons, general treatment of poison, systemic antidotes, treatment of insecticide poisoning, heavy metal poisoning, narcotic drug, barbiturate and organophosphorous poisoning. Drug dependence, drug abuse, addictive drugs and their treatment.

IV/IV B.PHARMACY (7th Semester)

704 PHARMACOLOGY-II (Practicals) (75 hrs.)

01. Introduction to basic equipment used in experimental pharmacology
02. Study of mydriatic & miotic effects on rabbit eye
03. Evaluation of local anaesthetic activity by surface anaesthesia method
04. Concentration response curve of acetylcholine
05. Bioassay of acetylcholine by interpolation method
- 06*. Effect of neostigmine on dose response curve of acetylcholine
- 07*. Effect of pancuronium on dose response curve of acetylcholine
- 08*. Three point bioassay method.
- 09*. Effect of adrenaline and acetylcholine on isolated frog's heart
- 10*. Effect of calcium chloride and potassium chloride on isolated frog's heart
- 11*. Effect of adrenaline in presence of a β -blocker on isolated frog's heart
- 12*. Effect of acetylcholine in presence of atropine on isolated frog's heart

TEXT BOOKS :

01. Goodman and Gilman- "The Pharmacological Basis of Therapeutics"
02. Textbook of Pharmacology by Rang and Dale.
03. Quientessence of Medical Pharmacology by C.Chowdary.
04. Lippincott's illustrated reviews : Pharmacology by Richard, D.Howland and MeryJ.Mylek.
05. Basic and clinical pharmacology by Bertran G.Katzung.
06. Review of medical pharmacology by F.H.Meyers, E.Jawetz and A.Goldfien.
07. Essentials of Medical Pharmacology by K.D.Tripathi.
08. Essential of Pharmacotherepeutics by F.S.K.Barar.

IV/IV B.PHARMACY (7th Semester)

MODEL QUESTION PAPER

703 PHARMACOLOGY - II (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. Classify antihypertensives with examples and describe the mechanism of action and clinical uses of any three different groups of antihypertensives.
2. Explain the pathogenesis of asthma. Classify antiasthmatic drugs and discuss the pharmacology of β -selective drugs.
3. Discuss in detail about various mechanisms of actions of different antibiotics with suitable examples.
4. What is diabetes ? Classify antidiabetic drugs and discuss the pharmacology of Insulin.
5. Define bioassay. What are its advantages and disadvantages ? How is posterior pituitary extract standardised for "oxytocic" activity.
6. Outline the principles of treatment of acute poisoning in general. Discuss about the management of organophosphorous poisoning.

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. Describe the mechanism of action, therapeutic uses and unwanted effects of digitalis.
8. Write notes on HMG-CoA reductase inhibitors.
9. Write short notes on expectorants.
10. Write short notes on pharmacology of prostaglandins.
11. Write about antimetabolites.
12. Write briefly on bacterial resistance.
13. Write about corticosteroids.
14. Write short notes on antithyroid drugs.
15. Write short notes on errors in bioassays.
16. Write short notes on test for pyrogens.
17. Give an account on drug addiction.
18. Write short notes on heavy metal poisoning and its treatment.

IV/IV B.PHARMACY (7th Semester)

MODEL QUESTION PAPER (Practicals)

704 PHARMACOLOGY-II

Time : 6 hours

Max.Marks : 70

1. Synopsis	:	10 Marks
2*. Major Experiment	:	30 Marks
3. Minor Experiment	:	20 Marks
4. Viva-Voce	:	10 Marks

Total:		70 Marks

IV. B.PHARMACY (7th Semester)
705 PHARMACEUTICAL ANALYSIS -II
(Theory) (75 hrs.)

General treatment of the theory, instrumentation and applications of the following analytical methods.

Unit : 01

Spectrophotometry (UV, Visible, IR), Nephelometry and Turbidimetry, Fluorimetry and Flame Photometry

Unit : 02

Potentiometry and pH metry, conductometry and high frequency titrations, polarography and amperometry.

Unit : 03

Chromatography-introduction, paper chromatography , Thin layer chromatography, Column chromatography, Gas Chromatography and Ion-exchange chromatography.

Unit : 04

High performance liquid chromatography, High performance thin layer chromatography, Electrophoresis and counter current distribution.

Unit : 05

Differential thermal Analysis, Basic Principles of Radio immuno assay and its applications in Pharmaceutical Analysis. Basic theory, instrumentation and applications of Nuclear magnetic resonance spectroscopy.

Unit : 06

Basic Theory, instrumentation and applications of mass spectroscopy, Electron spin resonance spectroscopy and X-ray diffraction.

IV/IV. B.PHARMACY (7th Semester)

706 PHARMACEUTICAL ANALYSIS – II (Practicals) (75 hrs.)

I. Visible Spectrophotometry

01. Determination of absorption maximum for potassium permanganate
02. Estimation of dapsone in tablets by colorimetry
- 03*. Estimation of sulfamethoxazole in oral suspension by colorimetry
04. Estimation of riboflavine in tablets by colorimetry
05. Estimation of terbutaline in Tablets by colorimetry
- 06*. Estimation of salbutamol sulphate in tablets by colorimetry
07. Estimation of isoxsuprine HCl in tablets.
- 08*. Estimation of salbutamol sulphate with Diazo Dapsone reagent
- 09*. Estimation of terbutaline sulphate with Diazo Dapsone reagent
10. Estimation of isoxsuprine HCl in tablets by colorimetry
11. Estimation of analgine in tablets by colorimetry
12. Estimation of ampicillin in capsules by colorimetry
13. Estimation of metoclopramide HCl in injections by colorimetry.

II. U.V.Spectrophotometry

14. Estimation of paracetamol in tablets by U.V.method.
15. Estimation of ciproflaxacin HCl in tablets by U.V.method

III. Nephelometry

- 16*. Estimation of sulphates by nephelometry

IV. Potentiometry

- 17*. Titration of strong acid with a strong base
18. Determination of dissociation constant of weak acid

V. Complexometry

19. Determination of hardness of tap water

VI. Chromatography

20. Identification of aminoacids by paper chromatography
21. Identification of aminoacids by TLC

VII. Karl Fisher Titration

- 22*. Determination of moisture content by KFR

TEXT BOOKS :

01. Quantitative Pharmaceutical Chemistry by Jenkins
02. A Text Book of Pharmaceutical Analysis by K.A.Connors.
03. Instrumental Methods of Analysis by H.H.Willard.
04. Modern methods of Pharmaceutical Analysis by R.E.Schirmer
05. Instrumental methods of chemical analysis by B.K.Sharma
06. Instrumental methods of chemical analysis by G.R.Chatwal.
07. Practical Pharmaceutical Chemistry by Becket and Stenlake
08. Organic spectroscopy by William Kemp
09. Pharmaceutical Drug Analysis by Ashuthosh Kar.

IV/IV. B.PHARMACY (7th Semester)
MODEL QUESTION PAPER
PHARMACEUTICAL ANALYSIS - II (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any FOUR questions (4 x 10 = 40 marks)

1. Explain Beer-Lambert's law and discuss about the deviations from Beer's law
2. Explain the principles of polarography ? Write the construction and working of a instrument used in polarography.
3. Explain detectors used in gas chromatography with a neat diagram.
4. Write the instrumentation of HPLC with a neat diagram.
5. What is differential thermal analysis ? Discuss the factors affecting DTA curve.
6. Explain the instrumentation of mass spectrometer with a neat diagram.

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. Mention the different types of electronic transitions observed in organic molecules.
8. Write the principle involved in fluorimetry
9. Give the principle involved in potentiometry
10. Mention the applications of conductometry
11. Write the adsorbants and spray reagents used in TLC.
12. Write the methodology for paper chromatography.
13. Write advantages of HPTLC over TLC
14. Mention briefly process involved in electrophoresis.
15. List out the applications of radioimmuno assay in pharmaceutical analysis
16. Write the theory involved in nuclear magnetic resonance spectroscopy
17. What is the principle involved in ESR
18. Write the theory involved in XRD analysis

IV/IV. B.PHARMACY (VIIth Semester)
MODEL QUESTION PAPER (Practicals)
706 PHARMACEUTICAL ANALYSIS-II

Time : 6 hours

Max.Marks : 70

- | | | |
|----------------------|---|----------|
| 1. Synopsis | : | 10 Marks |
| 2*. Major Experiment | : | 30 Marks |
| 3. Minor Experiment | : | 20 Marks |
| 4. Viva-Voce | : | 10 Marks |
| | | ----- |
| Total : | | 70 Marks |
| | | ----- |

:: 129 ::

IV/IV. B.PHARMACY (7th Semester)
707 INDUSTRIAL MANAGEMENT AND PHARMACEUTICAL
MARKETING (50 hrs.)

Unit : 01

Elements of Organization and Management : Functions of management

Unit : 02

Plant location and lay-out of an industry : various factors affecting locational aspect, layout of building and equipment product lay-out v/s process layout, drug store location and selection of premises, drug store management.

Unit : 03

Production planning and Control : Scientific purchasing, quality control, problems of productivity, stores organization, location of stores, receiving, inspection of materials, issue from the store, control of stores and stocks, Store Accounting and Records.

Personnel management : Selection, Appointment, training, transfer, Promotion, demotion policies, remuneration, job evaluation, human relations.

Unit : 04

Sales organisation : Market, definition-Determent approaches to the study of marketing, institutional approach, Market planning – Product planning, method of marketing, wholesale retailers, functional approach, cost and efficiency in marketing commodity approach.

Distribution polices : pharmaceutical product marketing, sales promotion policies-Detailing to physician, professional persons, sampling, window and interior display, product advertising, sales promotion, publicity.

Unit : 05

Elementary Industrial Accountancy : Elements of Double entry book Keeping, Books of Accounts-Journal and ledger, cash book. Balance sheet, Profit and Loss Account, Principles of Costing and Estimating.

Unit : 06

Regulatory affairs :

- (a) Schedule M of Drugs and Cosmetics act
- (b) Drug Development Stages - NDA and NADA filing
- (c) ICH guidelines - Introduction.

TEXT BOOKS :

- 01. Production Management by K.Aswathappa.
- 02. Marketing Management by Sherlekar.
- 03. Drug Store Management by Mahesh
- 04. Pharmaceutical Production and Management by C.V.S.Subrahmanyam
- 05. Advanced accounts by M.C.Shukla

IV/IV. B.PHARMACY (7th Semester)
MODEL QUESTION PAPER (Theory)
INDUSTRIAL MANAGEMENT

Time : 3 hours

Max.Marks : 70

SECTION-A

Answer any FOUR questions (4 X 10 = 40 marks)

1. Explain the elements of organization.
2. What are the factors that affect the plant layout ?
3. Discuss various methods of selection. Explain the job evaluation methods suitable for pharmaceutical industry.
4. Explain about sales promotion policies
5. Write the importance and method of preparation of Balance sheet.
6. Discuss about ICH guidelines in detail.

SECTION - B

Answer any TEN questions (10 X 3 = 30 marks)

1. Explain about any two functions of management
2. Write about personal management
3. Draw layout for parenterals manufacturing.
4. Write a note on drug store management.
5. How materials are issued from the store ?
6. How the records are maintained in the store ?
7. Write a short notes on method of marketing .
8. Write the differences between wholesale marketing and retail marketing
9. Write a note on journal
10. What is cash book and what are the different forms of it ?
11. Write a short notes on schedule "M"
12. How the NDA filling was carried for a drug ?

IV/IV. B.PHARMACY (8th Semester)
801 PHARMACEUTICAL CHEMISTRY -V
(NATURAL PRODUCTS)- (Theory) (75 hrs.)

Unit : 01

Carbohydrates : General aspects of mono, di and polysaccharides. Chemistry of glucose, fructose, sucrose and lactose.

Glycosides : Preparation and properties of methyl glycosides. A knowledge of the sources, chemistry and uses of cardiac glycosides and Anthraquinone glycosides, structural elucidation of amygdalin and salicin

Unit : 02

Proteins : An elementary knowledge of the classification and general characteristics of proteins, amino acids and their relationship to proteins. Chemistry of oxytocin, Chemistry and biological significance of purines, uric acid, xanthine bases and nucleic acids.

Unit : 03

Fats and Oils : The extraction, general composition, properties and analysis of fixed oils, fats and waxes.

Terpenes : Occurrence, general methods of isolation and classification of terpenes, Structural features and inter relationship of geraniol, citral, limonene, α -terpineol and menthol. General composition, properties, analysis of essential oils official in I.P. Chemistry and biological significance of flavonoids

Unit : 04

Alkaloids : Classification, general methods of extraction and determination of chemical structure. Quantitative determination of functional groups. Determination of the structures of ephedrine, nicotine and papaverine.

Unit : 05

Steroids and Hormones: Nomenclature, chemistry of ergosterol, cholesterol, bile acids and cortisone, preparation and structures of sex hormones, interrelationship of estradiol, estrone and estroil. Synthesis of progesterone, irradiation of ergosterol and preparation and properties of thyroid hormones.

Unit : 06

Vitamins : Classification, determination of structures of thiamine, riboflavin and ascorbic acid, skeleton structures of vitamins official in I.P. A study of their properties, stability and uses

IV/IV. B.PHARMACY (8th Semester)
802 PHARMACEUTICAL CHEMISTRY - V
(NATURAL PRODUCTS) (Practicals) (75 hrs.)

- 01*. Determination of acid value of fixed oil
- 02*. Determination of saponification value of a fixed oil
- 03. Determination of ester value of oil
- 04*. Determination of iodine value of oil

Volatile Oils

- 01*. Determination of cinnamic aldehyde in cinnamon oil
- 02. Determination of eugenol in clove oil
- 03. Qualitative analysis of natural products (Comprises of amino acids, carbohydrates, proteins, alkaloids, glycosides, steroids, flavonoids)
- 04. Isolation of casein from the milk
- 05. Isolation of piperine from black pepper powder
- 06*. Estimation of ephedrine hydrochloride by non aqueous titrimetry
- 07*. Estimation of quinine sulphate
- 08*. Extraction of caffeine from tea dust.

TEXT BOOKS :

- 01. Organic Chemistry - Vol. II by I.L.Finar
- 02. Organic, Pharmaceutical and Medicinal Chemistry by Wilson and Gisvold.
- 03. Remington's Text Book of Pharm. Sciences.
- 04. Text book of Medicinal Chemistry by A.Burger
- 05. Rama Rao Nadendla, Pharmaceutical Organic Chemistry, (Chemistry of Heterocyclic and Natural Compounds), Vallabh Publications, New Delhi
- 06. Organic chemistry of natural products by Gurdeep chatwal, volume I & II.
- 07. Organic chemistry of natural products by O.P.Agharwal volume I & II.

IV/IV. B.PHARMACY (8th Semester)

MODEL QUESTION PAPER

PHARMACEUTICAL CHEMISTRY-VI (NATURAL PRODUCTS)

Time : 3 hours

Max.Marks : 70

SECTION-A

Answer any FOUR questions (4 X 10 = 40 marks)

1. What are alkaloids ? How are they isolated and identified ? Discuss the structural elucidation of nicotine.
2. Classify vitamins with examples and discuss the structural elucidation of Riboflavin.
3. Discuss the important reactions and structural features of glucose.
4. Discuss the chemical relationship between oestrone, oestradiol and oestriol and describe the synthesis of oestrone.
5. Classify terpenes with examples, State isoprene and special isoprene rules. How do you elucidate the structure of citral ?
6. Classify aminoacids with examples ? Write the relationship between aminoacids, polypeptide and proteins ? Explain how do you convert xanthine into caffeine

SECTION - B

Answer any TEN questions (10 X 3 = 30 marks)

1. What is mutarotation and write its significance ?
2. Write a brief account on chemistry of cardiac glycosides ?
3. How do you determine methoxyl groups in papaverine ?
4. What is Isoelectric point and write its significance.
5. Write short notes on nucleic acids
6. Give a brief account on chemistry of flavanoids
7. How do you confirm the presence of pyrimidine in thiamine.
8. How Hoffmann exhaustive methylation is used to determine the structure of alkaloids.
9. What are vitamins. Write the structure of any three vitamins
10. Give a synthetic scheme for conversion of diosgenin to progesterone
11. Write short note on biological role of thyroid hormones.
12. How do you confirm the presence of keto.enol sysemin vitamin C ?

IV/IV. B.PHARMACY (8th Semester)

MODEL QUESTION PAPER (Practicals)

802 PHARMACEUTICAL CHEMISTRY-V (Natural Products)

Time : 6 hours

Max.Marks : 70

1. Synopsis	:	10 Marks
2*. Major Experiment	:	30 Marks
3. Minor Experiment	:	20 Marks
4. Viva-Voce	:	10 Marks

Total:		70 Marks

IV/IV. B.PHARMACY (8th Semester)

803 PHARMACOGNOSY- II (Theory) (75 hrs.)

Systematic pharmacognostic studies of following categories of crude drugs

Unit : 01

Glycosides : Aloes, Ammi, Brahmi, Buckwheat, Cantharides, Cascara, Chirata, Digitalis, Dioscorea, Gentian, Ginseg, Kalmegh, Liquorice, Psoralea, Quassia, Senna, Rhubarb, Squill, Strophanthus, Wild Cherry bark.

Unit : 02

Alkaloids : Aconite, Belladonna, Cinchona, Colchicum, Datura, Duboisia, Ephedra, Ergot, Hyoscyamus, Ipecac, Kurchi, Lobelia, Nux-vomica, Opium, Rauwolfia, Solanum khasianum, Vasaka, Vinca, Withania.

Unit : 03

Volatile oils : Bitter orange peel, Caraway, Cardamom, Cassia, Cinnamon, Citronella, Civet, Clove, Corriander, Dill, Eucalyptus, Fennel, Gaultheria, Lemonpeel, Musk, Nutmeg, Palmarosa, Peppermint, Saffron, Sandal wood, Tulsi, Vetiver.

Unit : 04

Historical development of plant tissue culture; types of cultures -a study of callus culture and cell suspension. Culture, nutritional requirements, growth and their maintenance. Applications of plant tissue culture in production of pharmaceutically important secondary metabolites.

Unit : 05

A study of the following Ayurvedic drugs, (Botanical source, chemical constituents, pharmacological actions and uses)

01. Amla (Phyllanthus emblica)
02. Bheda (Terminalia bellerica)
03. Kantkari (Solanum xanthocarpum)
04. Malkangni (Celactrus panicula)
05. Tylophera(Tylophora indica)
06. Sataver(Asparagus recomosus)
07. Bhilawa(Semecarpus anacardium)
08. Kalijiri(Vernonia anthelmintica)
09. Kaner(Nerium indicum)
10. Punarnava (Bocrhaevic diffuca)
11. Sankhapushpi

Unit : 06

Lipids : Bees wax, Castor oil, Cocoa butter, Cod-liver oil, Hydnocarpus oil, Kokum butter, Lard, Linseed oil, Rice bran oil, Skark liver oil and wool fat.

IV/IV. B.PHARMACY (8th Semester)

804 PHARMACOGNOSY - II (Practicals) (75 hrs.)

- I*. Study of Morphology and transverse section of the crude drugs.
- | | | |
|--------------|-------------|--------------|
| a. Fennel | b. Clove | c. Coriander |
| d. Nuxvomica | e. Cinnamon | f. Cinchona |
| g. Dill | h. Ephedra | i. Ipecac |
| j. Senna | k. Vasaka | l. Vinca |
- II. Identification of powdered crude drugs based on their microscopical characters.
- | | | |
|--------------|-------------|--------------|
| a. Senna | b. Vasaka | c. Ginger |
| d. Cinchona | e. Cinnamon | f. Squill |
| g. Rauwolfia | h. Kurchi | i. Naxvomica |
| j. Quassia | | |
- III*. Identification powdered crude drugs (Listed in II) in their mixtures based on microscopical characters.
- IV. Aseptic seed germination (Trigonella seeds)
- V. Callus initiation and establishment (Catharantus roses leaves)
- VI. Morphology of crude drugs
- | | | |
|--------------------|------------------------|---------------|
| 01. Fennel | 02. Clove | 03. Coriander |
| 04. Cardamom | 05. Nuxvomica | 06. Cinnamon |
| 07. Cinchona | 08. Dill | 09. Quassia |
| 10. Ephedra | 11. Senna | 12. Vinca |
| 13. Datura | 14. Tulsi | 15. Nutmeg |
| 16. Peppermint oil | 17. Lemon peel | 18. Aconite |
| 19. Ashwagandha | 20. Kurchi | 21. Rauwolfia |
| 22. Dioscorea | 23. Arjuna | 24. Chirata |
| 25. Squill | 26. Gentian | 27. Ginger |
| 28. Turmeric | 29. Glycerrhiza | 30. Amla |
| 31. Ipecac | 32. Bitter Orange Peel | |

TEXT BOOKS :

01. Tyler, V.C., Brady, L.R. and Robbers, J.E. "Pharmacognosy" 8th Ed., Lea and Febiger, Philadelphia.
02. Text Book of Pharmacognosy by T.E.Wallis.
03. Trease, G.E. and Evas, W.C., "Pharmacognosy" 11th and 12th editions, Bailliere Tindall, U.K.
04. Kokate, C.K., Purohit A.P. and Gokhale, S.B., "Pharmacog nosy" Nirali Prakashan, 1990.
05. Ross, M.S.F. and Brain, K.R., "an Introduction to Phytopharmacy Pitman Medical-Kent.
06. Indian Material Medica by A.K.Nadkarni
07. Essentials of Pharmacognosy by Dr.S.H.Ansari.
08. Pharmacognosy and Phytochemistry by Ashutoshkar.

IV/IV. B.PHARMACY (8th Semester)

MODEL QUESTION PAPER

PHARMACOGNOSY-II (Theory)

Time : 3 hours

Max.Marks : 70

SECTION - A

Answer any four questions (4 X 10 = 40 marks)

1. Write the method of preparation, chemical constituents and uses of Aloes
2. Describe Ergot life cycle, chemistry and uses of the ergot alkaloids.
3. Write the systematic pharmacognostic study of Cinnamon
4. Write the establishment, measurement of growth and production of secondary metabolites in callus and cell suspension.
5. Give the biological source, chemical constituents and uses of amla and sataver.
6. Write the systematic pharmacognostic study of Castor oil

SECTION - B

Answer any TEN questions (10 x 3 = 30 marks)

7. Write the biological source and uses of liquorice and Cantharides.
8. Describe the chemistry of cardiac glycosides.
9. Write the chemical constituents and uses of any two crude drugs containing indole alkaloids.
10. Write the biological source and chemical test for ipecae and Colchium
11. Give the comparative microscopy of Fennel and Coriander.
12. Write the biological source and active constituents of Ciret and Musk.
13. Enumerate nutritional requirements of plant tissue cultures.
14. Give an account on surface sterility of an explant in plant tissue cultures.
15. Write the biological source and uses of Bhilawa and Kantakari
16. Write the chemical constituents and uses of Tylophera and Punarnava
17. Describe the physico chemical properties and identification tests for lipids
18. Write the method of preparation and uses of woolfar.

IV. B.PHARMACY (8th Semester)

MODEL QUESTION PAPER (Practicals)

804 PHARMACOGNOSY-II

Time : 6 hours

Max.Marks : 70

- | | | |
|----------------------|---|----------|
| 1. Spotting | : | 10 Marks |
| 2*. Major Experiment | : | 30 Marks |
| 3. Minor Experiment | : | 20 Marks |
| 4. Viva-Voce | : | 10 Marks |

Tota : 70 Marks

IV/IV. B.PHARMACY (8th Semester)

805 GOOD MANUFACTURING PRACTICES AND VALIDATION

(Theory) (50 hrs)

Unit : 01

Concepts and Philosophy of Good Manufacturing Practice (GMP). Brief introduction of CGMP.

Unit : 02

Concepts and Philosophy of Validation. Validation methods of equipment

Unit : 03

Validation methods of water supply systems, deionised and distilled water and water for injection.

Unit : 04

Calibration of Analytical Instruments (A brief introduction). Calibration of Spectrophotometer and HPLC instrument as per ICH guidelines.

Unit : 05

Sampling Techniques, Computer applications in GMP and GLP, Statistical quality control and control charts.

Unit : 06

Concepts and Philosophy of GLP, SOP, ICH and ISO-9000.

TEXT BOOKS :

1. Good Manufacturing practice (GMP) - Mehra
2. How to practice GMP - PP Sharma
3. Quality Assurance of Pharmaceuticals (Vol-1 and 2, Pharma Book syndicate, Hyderabad)
4. A Guide to total quality management - K Maitra and S K Ghosh
5. Quality Assurance and Quality Management in pharmaceutical Industry-Y Anjaneyulu and R.Marayya.
6. ISO 9000 and Total Quality Management - S K Ghosh.
7. Quantitative Analysis of Drugs in Pharmaceutical Formulations- P.D.Sethi.

IV/IV. B.PHARMACY (8th Semester)

MODEL QUESTION PAPER

805 GOOD MANUFACTURING PRACTICES AND VALIDATION

Time : 3 hours

Max.Marks : 70

SECTION-A

Answer any four Questions

(4 x 10=40)

1. What is Good Manufacturing Practice (GMP) ? Explain in detail.
Add a note on CGMP.
2. Explain the concept of Validation in Pharmacy.
3. Write a note on Validation methods of water supply systems.
4. What is meant by Calibration of analytical instruments ?
Give the detailed procedure for the calibration of Spectrophotometer.
5. Write a note on sampling techniques. Explain in detail about correlation and regression and Analysis of Variance (ANOVA).
6. Write a note on any two of the following :
(A) GLP (B) SOP (C) ICH

SECTION - B

Answer any TEN of the following .

(10 x 3 = 30 marks)

7. Give the importance of GMP in Pharmaceutical Industry.
8. Write a brief note on CGMP.
9. What is Validation ?
10. Explain in brief about validation of pharmaceutical equipment.
11. How do validate deionised and distilled water systems.
12. What is water for injection ? Write briefly about validation of water for injection system.
13. What is Calibration of analytical instruments ? Explain in brief.
14. Write about the Calibration HPLC instrument as per ICH guidelines.
15. Explain precision and accuracy in detail. Give the importance of the above in Pharmaceutical Analysis.
16. Write a note on (a) t-test and (b) F-test
17. Explain in detail about ISO-9000
18. What do you mean by Standard operating procedure (SOP) ?
Explain in brief.