

First B.Pharmacy Exam.2009
(Four Year Integrated Course)

Prospectus No.09144

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

(FACULTY OF MEDICINE)

PROSPECTUS

OF

THE FIRST EXAMINATION FOR THE DEGREE OF
BACHELOR OF PHARMACY, 2009.
(FOUR YEAR INTEGRATED COURSE)



Visit us at www.sgbau.ac.in

2008

Price Rs. 8/-

PUBLISHED BY

Dr. K.G.Khamare

Registrar

Sant Gadge Baba Amravati University,
Amravati 444-602

-
- © 'या अभ्यास क्रमिकेतील (Prospectus) कोणताही भाग संत गाडगे बाबा अमरावती विद्यापीठाच्या पूर्वानुमती शिवाय कोणासही पुनर्मुद्रित किंवा प्रकाशित करता येणार नाही.'
- © "No part of this prospectus can be reprinted or published without specific permission of Sant Gadge Baba Amravati University."

Examination Leading to the degree of भेषजी स्नातक

(BACHELOR OF PHARMACY)

(New)

1. There shall be four Examination leading to the degree of भेषजी स्नातक (Bachelor of pharmacy), namely:

- (i) the प्रथम भेषजी स्नातक (First B.Pharm) Examination at the end of the first year;
- (ii) the द्वितीय भेषजी स्नातक (Second B.Pharm) Examination at the end of the second year;
- (iii) The तृतीय भेषजी स्नातक (Third B. Pharm.) Examination at the end of the third year and;
- (iv) the अन्त्य भेषजी स्नातक (Final B. Pharm Examination at the end of the fourth year).

2. The examinations specified in Paragraph 1 shall be held twice a year at such places and on such dates as may be appointed by the Board of Examination.

3. An applicant for admission to an examination specified in Paragraph 1 shall prosecute a regular course of study in courses prescribed for the examination concerned for not less than one academic year in the University Department of Pharmaceutical sciences or in a College affiliated to the University.

4. Subject to his compliance with the provisions of this Ordinance and of other Ordinances in force from time to time , an applicant for admission to-

- (A) The प्रथम भेषजी स्नातक (First B. Pharm) Examination shall have passed not less than one academic year previously-
 - (i) the Diploma in Pharmacy Examination from an Institution recognised by the Pharmacy Council of India ; with minimum 50% marks

* Effective from the Academic session, 1977-78 as approved by the Executive Council, dated, 23/24-5-77 and amended by Ordinance No. 20 of 1979 and 21 of 1981(Executive Council, dated 19-4-1980 and 25/26-4-1981 and Further amended by Ordinance Nos 19 and 26 of 1988, 1 of 1986, 1 of 1989, 6 of 1990 and 4 of 1992 (approved by the Executive Council dated 4/5-1-1983, 29-3-1986, 25-9-1989, 27-7-1990 and 25-4-1992 respectively.)

(ii) the 12th Standard Examination of the Maharashtra State Board of Secondary and Higher Secondary Education with English , Physics , Chemistry and Biology or Mathematics as subjects of study at the 12th Standard; securing minimum 50% marks(45% marks for backward class candidates from Maharashtra) in the said subjects taken together and passed in the same sitting

or

(iii) An Examination recognised as equivalent thereto in such subjects and with such standards of attainments as may be prescribed

(B) The द्वितीय भेषजी स्नातक (Second B.Pharm) Examination -

Shall have passed not less than one academic year previously the प्रथम भेषजी स्नातक (First B. Pharm) Examination of the University or the post H.S.S.C. Diploma in Pharmacy (i.e. according to Education Regulation, 1991 of Pharmacy Council of India) from the Board of Technical Education or equivalent from an institute approved by Pharmacy Council of India in first attempt scoring not less than 600 marks out of 1000 marks at D.Pharm. Part-II Examination, provided that they appear and pass in the theory papers of Pharmaceutical Chemistry-II (Organic), Pharmaceutical Microbiology, Mathematics and Statistics of First B.Pharm. examination otherwise, their result of the third B.Pharm. examination shall not be declared.

(C) The तृतीय भेषजी स्नातक (Third B.Pharm) Examination-shall have passed the द्वितीय भेषजी स्नातक (Second B.Pharm) Examinations of the University not less than one academic year previously.

(D) The अन्त्य भेषजी स्नातक (Final B.Pharm) Examination-i) shall have passed the तृतीय भेषजी स्नातक (Third B.Pharm) Examination of the University not less than one academic year previously.

5. Without prejudice to the other provisions of Ordinance No. 6 relating to the Examination in General , the provisions of Paragraphs 5,7,8,10,27,31 and 32 of the said Ordinance shall apply to every Collegiate candidate.

6. The fee for each examination and practical examination shall be as prescribed by the University, from time to time.

7. An applicant for admission to an examination shall satisfy the Head of the Department /Principal in the Terminal and other Tests conducted during the academic year regarding his suitability to take the examination.

8. The maximum marks allotted to the Sessional Examination in each paper, the written part and the practical part for each of the Four Examinations shall be per regulations.

9. The scope of the subjects shall be as indicated in the Syllabus.

#10 The Head/ Principal shall maintain in his office a complete record of marks obtained by the candidate in the sessionals. He shall send to the Registrar in a sealed cover the final marks in sessional examination obtained by every applicant. No candidate shall be allowed to appear at an examination unless he obtains at least 63 marks out of 140 marks allotted to all theory sessional taken together and 50 marks out of 100 marks allotted to all practical sessionals taken together.

#11. In order to pass an examination an examinee-

- (i) Shall obtain not less than 45% of the total marks allotted to each written paper and its respective sessional Examination taken together as shown in the concerned Appendix;
- (ii) Shall obtain not less than 50% of the total marks allotted to each practical and its respective sessional taken together as shown in concerned appendix.

12. There shall be no classification of successful examinees at the प्रथम , द्वितीय व तृतीय भेषजी स्नातक (First , Second and Third B.Pharm) Examinations.

#13. Division of Successful examinees at the अन्त्य भेषजी स्नातक (Final B.Pharm) examination shall be determined on the basis of the aggregate marks obtained at the तृतीय आणि अन्त्य भेषजी स्नातक (Third and Final B.Pharm) examinations taken together.

14. Those obtaining 60% or more marks in the aggregate shall be placed in the First Division , and all other successful examinees in the second Division.

15. An examinee who is successful at an examination and obtains not less to 75% of the total marks prescribed in a subject , shall be declared to have pass examination with Distinction in that subject.

16. An unsuccessful examinee at the प्रथम, द्वितीय व तृतीय (First, Second or Third B.Pharm) examinations who fails to secure the prescribed minimum marks in not more than four theory papers , and not more than three practical examinations may , at his option, be admitted to subsequent examination in that paper practical only on payment of fresh fee. An examinee under this provision shall be allowed to keep terms in the next higher class. He may take both examinations simultaneously, but his result at the higher Examination shall not be declared unless he is declared successful at the lower examination.

The students who has passed first B.Pharm. course from Maharashtra University of Health Sciences, Nashik and admitted to the second year B.Pharmacy course of Amravati University shall be admitted to the third year new B.Pharm. course of Amravati University irrespective of passing in the subject Pharmaceutical Microbiology of first year new B.Pharmacy course of the University.

Provided, the students should either pass or get A.T.K.T. in second year B.Pharm. course of Amravati University.

Provided, secondly that the result of third year B.Pharmacy examination shall not be declared unless he has passed first and second year of B.Pharmacy (new course) of the University.

17. The students are eligible for admission to final year of B.Pharm. course of Amravati University who have passed their third year examination from Maharashtra University of Health Sciences, Nashik or failed but became eligible to keep term in the final year B.Pharm. class of Amravati University, as the case may be.

18. An examinee failing in more than four theory papers and not more than three practicals may, at his option, appear as an ex-student at a subsequent examination in the subjects in which he has failed , on payment of fresh fee. If he clears the subject in which he has failed he shall be declared to have passed the examination . An examinee availing of exemptions under the provision of this paragraph shall not be allowed to keep terms at the next higher class.

Provided that an examinee , in the event of failing to pass the examination but succeeding in clearing enough number of subjects to bring him within the ambit of Paragraph 16, shall be allowed to keep terms at the next higher class after the declaration of his subsequent result.

%19. If a student fails in an examination his marks of Internal/ Sessional Assessment of Theory of the examination shall be carried over for the next examination. However, he can give a declaration to the effect that his Internal/ Sessional Assessment marks of the Theory should not be counted and his marks in the Theory shall be only on the basis of external examination.

\$20. (a) Ex-Student successful at the First, Second and Third B.Pharm old course examination shall be admitted to the next higher class of B.Pharm. New Course, but shall be permitted to appear at the higher class new course examination, Provided that they submit a certificate from the Head of the Department/Principal of the College of Pharmacy satisfy that they have satisfactorily undergone a course of study in all the subjects of new course in earlier old B.Pharm. classes or otherwise.

#(b) Unsuccessful candidates at First, Second, Third and final year B.Pharm., Examination under old scheme will be given four consecutive chances in addition to the main examination to clear the remaining subjects. Students failing to pass the examination under the old course as stated above will have to undergo regular course of study of the equivalent examination under this Ordinance.

21. Provisions of Ordinance No. 18 of 2001 relating to an Ordinance to provide grace marks for passing in a Head of passing and Improvement of Division (Higher Class) and getting distinction in the subject and condonation of deficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance 2001 shall apply to the examinations under this Ordinance.

22. As soon as possible after the examination, but not later the 30th June next following in case of examinations held in summer and 28th february next following in case of examinations held in winter, the Board of Examination shall publish a list of successful examinees. The list of successful examinees at the अन्त्य भेषजी स्नातक (Final B.Pharm.) Examination shall be arranged in the First and Second Division, as envisaged in Paragraph 13 of this Ordinance the names of Examinees passing the B.Pharm. Examination as a whole in the minimum prescribed period and obtaining the prescribed number of places in the First or Second Division shall be arranged in order of Merit as provided in the examinations in General Ordinance No. 6

23. Notwithstanding anything to the contrary in this Ordinance , the Degree of Bachelor of Pharmacy shall not be conferred upon a person unless:-

Introduced from 25-9-1989., % introduced from 29-3-1986.

\$ Introduced from 25-9-1989.

Latest amended by Ord.No.9 of 2003, 12 of 2004, & 9 of 2005

He Undergoes a practical training of not less than eight weeks after taking the Third or Final B. Pharm. Examination in Pharmaceutical concern approved by the Head/Principal and unless the Head/ Principal certifies that the person has satisfactorily completed the said practical industrial training as the case may be.

24. Successful examinees at the प्रथम भेषजी स्नातक , द्वितीय भेषजी स्नातक व तृतीय भेषजी स्नातक (First B.Pharm, Second B. Pharm, and Third B. Pharm) Examinations shall be entitled to receive a Certificate signed by the Registrar; and those successful at the अन्त्य भेषजी स्नातक (Final B.Pharm. Examination) shall, on payment of the prescribed fees, receive a degree, in the prescribed form, signed by the Vice-Chancellor.

Regulation No.24 of 2003

Examinations leading to the Degree of भेषजी स्नातक (Bachelor of Pharmacy) Regulation, 2003.

Whereas it is expedient to make Regulation regarding Examinations leading to the Degree of भेषजी स्नातक (Bachelor of Pharmacy), for the purposes hereinafter appearing, the Management Council is hereby pleased to approve the following Regulation.

1. This Regulation may be called "Examinations leading to the Degree of भेषजी स्नातक (Bachelor of Pharmacy) Regulation, 2003."
2. This Regulation shall come into force with effect from -
 - i) the academic session 2002-2003 for the First Examination for the Degree of Bachelor of Pharmacy,
 - ii) the academic session 2002-2003 for the Second Examination for the Degree of Bachelor of Pharmacy,
 - iii) the academic session 2003-2004 for the Third Examination for the Degree of Bachelor of Pharmacy, and
 - iv) the academic session 2004-2005 for the Final Examination for the Degree of Bachelor of Pharmacy.
3. The Schemes for First, Second, Third, and Final Examination for the Degree of Bachelor of Pharmacy shall be as given in Appendices-A, B, C, and D appended with this Regulation.

Syllabus Prescribed for**B.Pharm First Year****I.T.1 General and Dispensing Pharmacy****Theory (75 Hours)**

- Evolution of Pharmacy and Pharmaceutical literature :** History of Pharmacy, Historical background and importance of various Pharmacopoeias with special reference to Indian Pharmacopoeia British Pharmacopoeia, United States Pharmacopoeia, International Pharmacopoeia and Extra Pharmacopoeia.
- Pharmacopoeial preparations :** Principles and methods of preparation of aromatic waters, spirits, extracts, syrups, glycerine, linctus, solutions, milks and magmas, mucilage and special preparations like pyroxyllins and flexible collodions.
- Galenicals :** Principles and methods of extraction, preparation of infusions, decoctions, tinctures, liquid, soft and dry extracts. Introduction and classification of pharmaceutical dosage form.
- Prescriptions :** Various parts of prescriptions and their functions, handling of prescriptions, sources of errors, care required in dispensing procedures including labelling of dispensed products. Preliminary knowledge of important Latin terms used in prescriptions and their translation into English.
- Pharmaceutical calculations and metrology :** Metric and Imperial systems of weights and measures used in prescriptions Posology, calculations of dosage for infants, children, adults and elderly patients, reducing and enlarging formulae, Percentage solutions, allegation methods, proof spirits, calculations involving alcohol dilutions; pH and buffer solutions, isotonic solutions, displacement value, calculations involving radioisotopes.
- Principles and procedures of dispensing prescriptions :** Principles involved and procedures adopted in dispensing of Liquid preparations such as mixtures, solutions, lotions, suspensions, emulsions, liniments; semisolid preparations such as ointments, creams, pastes, jellies, suppositories; solid dosage forms such as powders, capsules, effervescent powders, tablet in tablets, lozenges, paints, sprays, inhalations and poultice.
- Incompatibilities :** Definitions, study of types of incompatibilities - physical, chemical and therapeutic, inorganic incompatibilities involving metals and their salts, non-metal, acids and alkalis : Organic incompatibilities involving specific organic salts, purine bases, alkaloids, pyrazolone derivatives, amino acids, quaternary ammonium compounds, carbohydrates, glycosides,

sulfonamides, local anesthetics, dyes, surface active agents, vitamins. Study of examples of prescriptions containing incompatibilities and their correction and dispensing methods.

I.P.1 General and Dispensing Pharmacy**Practical (75 Hours)**

- Dispensing of prescriptions falling under the categories of mixtures, solutions, emulsions, creams, ointments, powders, suppositories, capsules, pastes, jellies, lozenges, lotions, liniments, inhalations and paints.
- Identification of various types of incompatibilities in prescriptions. Correction and dispensing of such prescriptions.
- Preparation of selected Pharmacopoeial preparations under the category of aromatic waters, spirits, solutions, infusions, tinctures and extracts.
- Various staining methods.
- Isolation of pure culture of Microorganisms and identification of microorganisms including biochemical tests.
- Test for sterility of apparatus, injections, transfusions and other pharmaceuticals.
- Bacteriological examinations of water, milk & food products.

Reference Books for I-T.1 / I-P.1 :

- Pharmaceutical Dosage and Drug Delivery systems- Ansel-Popovich and Allen (Williams & Wilkins)
- Lachman-Liberman and Kanig - Industrial Pharmacy (Leci Febiger)
- Remington : The Science and practice of Pharmacy - Alfonso and Gennaro (Mack Publishing Co.)
- Bentley's T.B. of Pharmaceutics - Rawlins (ELBS)
- Vinita Kale and Kishore Bhusari, Practical Microbiology : Principles and Techniques, Himalaya publishing House, Mumbai.
- Dispensing of medications, by Hooper (Mack Publishing)

I-T.2 Pharmaceutical Chemistry-I (Inorganic)**Theory (50 Hours)**

An outline of methods of preparation, uses, storage condition, sources of impurities, tests for purity and identity, including limit tests for iron, arsenic, lead, heavy metals, chloride, sulphate and special tests. (excluding assays)

- Pharmaceutical aids and necessities :** Acids, bases, buffers, antioxidants, water, preservatives, adsorbants, diluents, excipients, suspending agents, colorants, etc.

2. **Major intra and extracellular electrolytes :** Physiological ions, electrolytes used in replacement therapy, physiological acid base balance, electrolytes used in acid-base therapy, electrolyte combination therapy, inorganic diuretics.
3. **Essential and trace ions :** Copper, zinc, chromium, manganese, molybdenum, selenium, sulphur and iodine.
4. **Gastrointestinal agents :** Acidifying agents, antacids, protectives and adsorbents, saline cathartics.
5. **Topical agents :** Protectives, antimicrobial, astringents.
6. **Dental Products :** Anticaries agents, dentifrices.
7. **Complexing and chelating agents used in therapy.**
8. **Gases and vapours :** Oxygen, anaesthetics and respiratory stimulants.
9. **Miscellaneous agents :** Selerosing agents, expectorants, emetics, poisons and antidotes, sedatives etc.
10. **Inorganic radiopharmaceutical :** Nuclear reactions, nomenclature, methods of obtaining, standard and units of activity, measurement of activity, clinical applications and dosage, hazards and precautions.

Reference Books :

- 1) Inorganic Medicinal and Pharmaceutical Chemistry - J.H.Block, E.B.Roche & I.O.Sonie, Co. Wilson (Varghese Pub.)
- 2) Bentleys and Driver's testbook of Pharmaceutical Chemistry.
- 3) Indian Pharmacopoeia, Latest edition.

I.P.2 **Pharmaceutical Chemistry-I (Inorganic)** **Practical (75 Hours)**

1. Prepare the following inorganic pharmaceuticals and perform the identification tests, limit tests and other tests as given in I.P. Aluminium hydroxide, barium sulphate, zinc oxide, magnesium sulphate, lithium carbonate, calcium carbonate, ferrous sulphate and potassium citrate boric acid.
2. Prepare and test purified water of Pharmacopoeial standard (I.P.)
3. Semi micro-identification test of mixture of cations and anions (not more than 4) as used in pharmaceuticals.
4. Test for purity for the following.
 - 1) Swelling power in bentonite
 - 2) Acid neutralising capacity in aluminium hydroxide gel.
 - 3) Amm, salts in potash alum.

- 4) Adsorption property in heavy kaolin.
- 5) Presence of iodates in potassium iodide.

Reference Books :

- 1) Vogel's Textbook of Quantitative Chemical Analysis.
- 2) A textbook of Micro & semimicro qualitative inorganic analysis by Vogel.
- 3) IP / BP / USP
- 4) Practical Pharmaceutical Chemistry-I & II by A.H.Beckett & J.B.Stenlake.

I.T.3 **Pharmaceutical Chemistry-II (Organic)** **Theory (75 Hours)**

The subject of organic chemistry will be treated in its modern perspective keeping for the sake of convenience, the usual classification of organic compounds.

1. **Structure and properties :** atomic structure, atomic orbitals, molecular orbital theory, wave equations, molecular orbitals, bonding and antibonding orbitals, co-valent bond, hybrid orbitals, intramolecular and intermolecular forces, bond dissociation energy, polarity of the bond, polarity of the molecule, electronegativity, inductive effects, resonance hyperconjugation, structure and physical properties.
2. **Optical activity and chirality, kinds of molecules** displaying optical activity, absolute configuration, methods of determining configuration, molecules with more than one chiral center, stereospecific and stereoselective synthesis, racemic modification, resolution, cis-trans isomerism, conformational analysis, Bayer's strain theory.
3. **Structure, nomenclature, preparation and reaction mechanism of :** Alkanes, alkenes, alkynes, cycloalkanes, dienes, benzene, polyaromatic compounds, arenes, alkylhalides, alcohols, ethers, epoxides, amines, nitro compounds, phenols, aldehydes and ketones, carboxylic acids, functional derivatives of carboxylic acids.
4. **Reactive Intermediates :** Carbocations, carbanions, carbenes, nitrenes, nitrenium ion - their generation and fate.
5. Nucleophilic aromatic substitutions.
6. Alpha, Beta - Unsaturated compounds.

7. Conservation of orbital symmetry, rules, electrocyclic, cycloaddition and sigmatropic reactions.
8. Catalysis by transition metal complexes. New organic reagents used in organic synthesis.

Reference Books :

- 1) Organic Chemistry by I.L. Finar.
- 2) Organic Chemistry by R.T. Morrison & R.N. Boyd.
- 3) Basic Principle of Organic Chemistry by J.D. Roberts & M.C. Caserio.

**I.P.3 Pharmaceutical Chemistry-II (Organic)
Practical (75 Hours)**

1. Synthesis of selected organic compounds (asprin, p-bromoacetanilide, anthraquinone from anthracene, reduction of nitrobenzene, paracetamol etc)
2. Identification of Organic compounds and their derivatization.
3. Introduction to the use of stereomodels.
4. An exercise involving separation of optically active isomer.

Reference Books :

- 1) Text Book of Practical Organic Chemistry by A.I. Vogel.
- 2) Practical Organic Chemistry by F.G. Mann and B.C. Saunders.
- 3) Pharmacopoeia of India.

**I.T.4 Pharmacognosy-I
Theory (50 Hours)**

1. **Definition, history**, scope and development of Pharmacognosy.
2. **Sources of drugs** : Biological, marine, mineral and plant tissue cultures.
3. **Classification of drugs** : Alphabetical, morphological, taxonomical, chemical and Pharmacological approaches for classification of drugs.
4. **Methods of classification of plants** : Plant taxonomy with special reference to the study of medicinally important families.
Apocynaceae, Solanaceae, Leguminosae, Liliaceae, Labiatae, Convulvulaceae, Compositeae.
5. **Elementary study of plant Genetics** : Polyploidy, mutation, hybridization and chemical reaces with reference to medicinal and aromatic plants.

6. **Approach to morphology** and histology of plant organs taking suitable examples of medicinal plants.
7. **Cultivation, collection** & processing conservation of medicinal plants for commercial market, Best management with special study of Pyrethrum, Neem, Tobacco, and their derived products.
8. Brief introduction of plant Constituents : Chemistry, biogenesis, properties and tests of identification for : Carbohydrates, lipids, tannins, proteins, resins, definition & general characteristics of alkaloids, glycooids, volatile and fixed oils.
9. **Systematic** Pharmacognostic study of the following crude drugs.
Carbohydrate : Agar, ispaghula, guar gum, alginate, honey, pectin, starch and bud.
Lipids : Castor oil, cocoa butter, olive oil, shark liver oil, wool fat, spermaceti, chalmoogra oil, neem oil.
Tannis : Gambier, black catechu, Myrobalan.
Proteins : Gelatin, Spirulina, Collagen and its products.
Resins : Polophyllum, cannabis, balsam of tolu, turmeric, ginger, asafoetida, capsicum.
10. **Qualitative Evaluation** : Use of camera lucida, stage micrometer and eye piece micrometer, methods and significant evaluation of stomatal palisade, ratio, vein-islet no., standardization of lycopodium and different methods of qualitative evaluation of drugs in power state used in lycopodium.
11. **Study of Pharmaceutical aids** : Study of biological sources, method of Preparation, chemical tests of identity and salient microscopical features of Pharmaceutical aids - talc, kaolin, natural colours, diatomite, asbestos, fillers earth, bentonite, starches, gums & fibres of pharmaceutical interest.
12. **Botanical sources**, names and uses, Pharmacological actions of Ayurvedic drugs :- Nirgundi (Vitex negunda), Nagarmotha (Cyperus rotundus), Neem (Azardichta indica), Maka (Eclipta alba), Giloy (Tinospora Cardifolia), Haldi (Curcuma longa), Pipali (Piper longum), Kalmegh (Andrographis paniculata), Bhui-amlam (Phyllanthus Niruri), Hirda (Terminalia chokula), Katki (Picrossluza Kurroa).

Reference Books :

- 1) Pharmacognosy by Trease & Evans
- 2) Pharmacognosy by Wallis
- 3) Pharmacognosy by Taylor & Evans

I.P.4**Pharmacognosy-I
Practical (75 Hours)**

1. Morphological and histological studies of the following drugs.
 - Leaf - Dhatura, Senna
 - Bark - Qassia, Cinnamom, Qinchona
 - Stem - Ephedra
 - Wood - Quassia
 - Flower - Clove
 - Fruits - Fennel, Coriander
 - Seed - Isabgol, Nux vomica
 - Root - Rauwolfia, Liquorice,
 - Rhizome - Ginger, Rodophyllum.
2. Experiments on : Loss on drying, extractive value, ash value, crude fibre, swelling index.
3. Chemical tests :
 - Carbohydrates -Acacia, agar, tragacanth, starch
 - Lipids - Specific chemical tests for oils
 - Proteins - Gelatin.
4. Taxonomical studies of families mentioned in theory.
5. Identification of drugs included in theory through morphological and sensory characters.
6. Microscopy of starches and starch products, identification of talc diatonite, asbestos, bentonite, filler's earth by microscopic characters.
7. Quantitative microscopy : Determination of stomatal index, palisade ratio, vcin-islet no.

Reference Books :

- 1) Practical Pharmacognosy by C.K.Kokate
- 2) Pharmacognosy of Powdered Crude Drugs - Iyengar.
- 3) Pharmacognosy by Wallis.

I.T.5**Anatomy and Physiology
Theory (75 Hours)**

1. **Introduction :** Definition and scope of anatomy, physiology and related sciences.

2. **Cellular basis of physiology :** Structure and functions of subcellular organelles, cell adhesion, molecules and gap junctions, Ionic channels and generation of membrane potentials. Structure and molecular mechanism of skeletal and smooth muscle contraction.
3. **Human skeleton :** Anatomical terminology. A study of human skeleton including account of skull, spine and important bones of upper and lower extremities, thoracic and pelvic regions. Brief description of important joints and skeletal muscles.
4. **Circulating body fluids :** Blood and its cellular components, blood types and blood transfusion, immune mechanisms and haemostasis. Lymph and lymph nodes.
5. **Cardiovascular system :**
 - a) **Heart :** Structure and molecular mechanism of contraction of cardiac muscle, Anatomy of heart. Origin and spread of cardiac excitation. Cardiac contractibility and its regulation. Cardiac cycle, heart sounds, basis principles of electrocardiogram.
 - b) **Systemic Circulation :** Structure of artery and vein, vascular distensibility, cardiac output, venous return and their regulation. Blood pressure and its regulation. Microcirculation and lymphatic circulation.
 - c) **Regional circulation :** Pulmonary circulation, cerebral circulation, coronary circulation, placental and foetal circulation.
6. **Nervous System :**
 - a) **Cellular physiology of nervous system :** Structure, impulse generation and conduction in neuron, glial cells, Anatomy, electrical events and chemical transmission in neuro effector junction.
 - b) **Subdivisions of nervous system :** Anatomy and function of various parts of central nervous system. Coverings of C.S.F. and cerebral ventricles.
 - c) **Somatic sensations :** Classification of somatic senses and sensory receptors. Detection and transmission of tactile, pain and thermal sensations.
 - d) **Motor functions :** Corticospinal and corticobulbar system. Posture regulating systems : Spinal integration, medullary components, midbrain components. The cerebellum, basal ganglia and physiology of overall motor control.
 - e) **Central Regulation of visceral function :** Medulla oblongata and hypothalamus. Physiology of regulation of hunger, thirst, and body temperature.

f) Neural basis of instinctual behaviour and emotions : Anatomy and function of limbic system. Physiology of sexual behaviour, fear and rage, motivation.

g) Higher function of nervous system : Hippocampus, Wernicke's area and Broca's area. Physiology of learning, memory and speech.

h) Arousal mechanisms, sleep and electrical activity of nervous system : Reticular formation, reticular activating system, thalamus and cerebral cortex. Electroencephalogram, Physiological basis of consciousness and sleep.

i) Autonomic Nervous System : Anatomical organisation, neurohumoral transmitters, adrenergic and cholinergic receptors and responses of effector organs to autonomic nerve impulses.

j) Reflexes : Physiological basis of monosynaptic and polysynaptic reflexes.

7. **Sensory Organs :**

a) Physiology of Vision : Anatomy of human eye, image forming mechanism, photoreceptor mechanism, visual pathways and cortex, colour vision, other visual function, eye movement.

b) Hearing and equilibrium : Anatomy of ear, mechanism of hearing, auditory, pathways, vestibular sensation and maintenance of equilibrium.

c) Chemical Senses : Receptors and pathways of smell and taste. Physiology of olfaction and gustation.

8. **Respiratory System :** Anatomy of Respiratory system, mechanism of pulmonary ventilation, pulmonary volumes, and capacities, physical principles and mechanisms of gaseous exchange and transport, regulation of respiration, physiological characteristics of emphysema, pneumonia, asthma tuberculosis, hypoxia, hypercapnia, cyanosis and dyspnea, artificial respiration.

9. **Digestive System :** Physiological anatomy of the digestive system, movements and secretions of its different parts and gut reflexes, digestion of various foods, physiology of gastrointestinal absorption.

10. **Excretory system :** Physiological anatomy of the kidneys and urinary tract, urine formation, glomerular filtration and its regulation, tubular reabsorption and secretion, regulation of tubular reabsorption, the counter current multiplier and exchange system, renal clearance tests, micturition.

11. **Acid-base physiology :** Hydrogen ion production, body buffer systems (bicarbonate, phosphate, and proteins), respiratory and

renal regulation of acid base balance, correction of acidosis and alkalosis.

12. **Endocrinology and Reproduction :**

a) Introduction to endocrinology and general mechanisms of hormone action :

Pituitary hormones, their physiological functions, their control by hypothalamus. Formation, secretion and regulation of secretion of thyroid hormones and their functions, diseases of the thyroid, adrenocortical hormones, their chemistry, secretion, regulation and functions. Abnormalities of adrenocortical secretion. Pancreatic hormones and their metabolic effects and pathophysiology of diabetes mellitus. Parathormone and calcitonin, control of calcium metabolism.

b) Reproductive and hormonal functions of the male and female :

Spermatogenesis and male sex hormones. Physiological anatomy of female sexual organs, menstrual cycle and puberty, pregnancy, parturition and lactation, menopause.

Reference Books :

- 1) Textbook of Medical Physiology by A.C. Guyton.
- 2) Samson Wriggs Applied Physiology by Keele & Neil.
- 3) Review of Medical Physiology - W.F. Ganong

I.P.5

Anatomy & Physiology

Practical (75 Hours)

1. Study of human skeleton and bones e.g. clavicle, scapula, humerus, ulna, radius, cervical, thoracic and sacral vertebrae, pelvic girdle, femur, tibia, fibula and skull.
2. Study of models of organs of various body systems and surgical instruments.
3. **Haematology :** Introduction to use and care of microscope, techniques to prick finger, blood smear, TLC, DLC, REC, platelet count, haemoglobin, reticulocyte count, bleeding time and coagulation time, ESR, packed cell volume, MCV :MCHC, C1.
4. **Human Physiology :** The recording of arterial pulse, blood pressure, effect of posture and exercise on blood pressure, mean pressure and heart rate, electrocardiogram and mean electrical axis, pulmonary function tests, PEFH, Rinne's and Webber's test, tendon reflexes, superficial reflexes, EEG, reaction time, sperm count.

5. **Experimental Physiology** : Introduction of physiological equipments and physiological solution, simple muscle twitch, fatigue in muscle-nerve preparation, amphibian, heart, rabbit jejunum, rectus abdominus muscle of frog.
6. **Histology** : Identification and study of histology of skeletal, cardiac and smooth muscles, heart, lung, spleen, kidney, pancreas, small intestine, liver, artery, vein, testes and ovary.

Reference Books :

1. Text Book of Medical Physiology by A.C.Guyton
2. Human Physiology by Chatterjee
3. Applied Physiology - Samson Wright's by Keele & Neil.

IT.6 **Pharmaceutical Microbiology** **Theory (50 Hours)**

1. Classification of microbes and their taxonomy, bacteria, viruses (DNA, RNA and retroviruses), fungi, actinomycetes, rickettsia and spirochaetes.
2. Nutrition, cultivation, isolation and identification of bacteria, viruses, protozoa and fungi.
3. Purification of bacterial culture, different staining techniques.
4. Microbial genetics & variation, bacterial enzymes.
5. **Infection** : Modes of microbial infection, transmission and control/prevention of bacterial, fungal, protozoal and viral diseases (and AIDS)
6. **Systematic Studies of organisms causing following infections** : Rheumatic fever, pneumonia, gonorrhoea, diphtheria, cerebrospinal meningitis, typhoid, bacillary and amoebic dysentery, cholera, plague, influenza, pertussis, whooping cough, gas-gangrene, tetanus, tuberculosis, leprosy, syphilis, rickettsia, rabies, poliomyelitis, dengue, small pox, chicken pox, measles, mumps, AIDS, malaria.
7. **Microbial spoilage and preservation of pharmaceutical products** : Types of spoilage, factors affecting microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage, preservation of pharmaceutical products, preservatives, evaluation of microbial stability of formulations.

8. Control of microbes by physical and chemical methods, disinfection.
9. **Sterilization** : Different methods, evaluation of sterilization methods, sterility testing of pharmaceutical products as per I.P. and B.P. requirements.
10. **Aseptic techniques** : Sources of contamination and methods of prevention, designing of a septic area, laminar flow equipment, their services and maintenance.
11. **Immunology** : Important contribution made by different scientists in the development of immunology, microbial invasion, non-specific host resistance and inflammatory response. Haemopoiesis (stem cells, lymphoid differentiation, non-lymphoid differentiation, soluble factors in haemopoiesis), lymphoid organs (primary & secondary), B, T and accessory cells and their role in immunity, types of immunity, antigen, antibodies, complement, Immune system - Humoral immunity, cellular, immunity, tolerance, bacterial resistance, immunogenetics, types of antigen - antibody reactions.
12. General methods of preparation, bacterial and viral vaccines, antitoxic sera, bacterial tests and preparations used in diagnosis of diphtheria and tuberculosis etc. standardization and preservation of immunological products as vaccines and sera.

Reference Books :

- 1) Microbiology, Pelzar & Reid
- 2) Industrial Microbiology, Prescott & Duner
- 3) Pharmaceutical Microbiology, Malcolm and Harris
- 4) Tutorial Pharmacy - Cooper & Gunn
- 5) Applied Microbiology for Pharmacy Biosciences by Vinita Kale and Kishore Bhusari, Himalaya Publishing House, Mumbai.

IT.7 **Mathematics & Statistics** **Theory (75 Hours)**

- An introductory review of elementary algebra, trigonometry, analytical plane geometry and mensuration.
1. **Differential calculus** : Continuity and limit, differentiation, derivability and deviation, RH derivatives and L.H. derivatives, differential general theorems and derivation, derivatives of trigonometric functions (including inverse trigonometric

functions) logarithmic differentiation, partial differentiation, maxima and minima (elementary).

2. **Integral calculus** : Integrator, as inverse process of differentiation, definite integrals, integration by substitution and by parts, integration of algebraic functions, evaluation of area and volume in simple cases.
3. **Differential equations** : Formation and derivation, order and degree, first order and degree, linear equations with constant coefficient, homogeneous linear equations (first method of solution only), Simultaneous differential equations which are linear and of first order.
4. **Laplace transformations** : Definition, transforms of elementary functions, properties of linearity and shifting, inverse laplace transforms, transforms of derivatives, solution of ordinary and simultaneous differential equations.
5. **Statistics** : Significant digits and rounding of numbers, data collection, random and non-random sampling methods, sample size, data organisation, diagrammatic representation of data, bar, pie, 2-D and 3-D diagrams, standard deviation and standard error of means, co-efficient of variation, confidence (fiducial) limits, probability and events, Bayes theorem probability theorem, probability distribution, elements of binomial and poisson distribution, normal distribution curve and properties, kurtosis and skewness, correlation and regression analysis, method of least squares, non linear regression, statistical inference, students and paired t-test, F-test and elements of Anova. Applications of statistical concepts in Pharmaceutical sciences.

Reference Books :

- 1) Text Book of Calculus, Part-I & II by Shantinayakan, S.Chand & Co.
- 2) Basic Statistics for Health Science Students by Dr.Phillips, N.H.Freeman & co.
- 3) Text Book of Mathematics for Pre medical Students by Bedi & Jain.

Also refer additional recommended book list enclosed at the end of syllabus.

ADDITIONAL BOOKS RECOMMENDED

IT IS UNDER STOOD THAT THE TEACHER WOULD FOLLOW AND RECOMMEND LATEST EDITION OF THE BOOK, HENCE THE SPECIFIC EDITION AND YEARS OF PUBLICATION ARE OMITTED.

1. Pharmaceutics (including Pharmaceutical Microbiology and Pharmaceutical Biotechnology)

- 01) A Owunwonne, Handbook of Radiopharmaceuticals, Narosa Publishing House, New Delhi.
- 02) A Pecile and A Resigno Pharmacokinetics, Plenum Press, NY.
- 03) Aiba Suichi, Humphrey and Millis, Biochemical Engineering, University of Tokyo Press.
- 04) Allwodd M C and Fell J T, Textbook of Hospital Pharmacy, Blackwell Scientific Publications, Oxford.
- 05) Ansel H.C., Introduction to Pharmaceutical Dosage Forms, K M Varghese & Co., Bombay.
- 06) Aulton M E Pharmaceutics - The Science of Dosage Form Design, ELBS/Churchill Livingstone.
- 07) Avis K E, Lachman L and Lieberman H A, Marcel Dekker Inc. Pharmaceutical Dosage Forms; Parenteral Medications, Vols. 1 & 2, NY.
- 08) Badger W L and Banchemo J T, Introduction to Chemical Engineering McGraw Hill International Book Co. , London.
- 09) Banker G S and Rhode C T Modern Pharmaceutics, Marcel Dekker Inc., NY.
- 10) Bean H S, Beckett A H, and Carless A H Advances in Pharmaceutical Sciences, Vol 1-4 Academic Press, London.
- 11) Bergey's Manual of Determinative bacteriology.
- 12) Bharati H K, Drugs and Pharmacy Laws in India, Sadhana Mandir, Indore.
- 13) Bolton Sanford, Pharmaceutical Statistics, Marcel Dekker Inc NY.
- 14) British National Formulary, No.25 Pub jointly by British Medical Association and Royal Pharmaceutical Society of Great Britain.
- 15) British Pharmacopoeia, Her Majesty's Stationery Office, University Press, Cambridge.
- 16) Brock T D, Madigen M T Biology of Micro-organism Prentice Hall, New Jersey USA.

- 17) Carter S J, Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS Publishers, Delhi.
- 18) Carter S J, Cooper and Gunn's Tutorial Pharmacy CBS Publishers, Delhi.
- 19) Carstensen J T, Drug Stability, Marcel Dekker Inc. NY.
- 20) Chittion HM and Witcofski RL, Nuclear Pharmacy, Lea and Febiger, Philadelphia.
- 21) Connors K A, Amidon G L and Stella V J, Chemical Stability of Pharmaceuticals, John Wiley & Sons NY.
- 22) Davis, Dulbetco, Eisen Microbiology.
- 23) Dittert LW Sprowl's American Pharmacy, J & B Lippincott Co, Philadelphia.
- 24) C G Brown, Unit operations (Indian Ed) Asia Publishing House, Bombay.
- 25) Giladi M & Perrier D, Pharmacokinetics, marcel Dekker Inc NY.
- 26) Remington's, the science and Practice of Pharmacy, Mack Publishing Co. Easton, Pennsylvania.
- 27) Hassan Willman E, Hospital Pharmacy, Lea & Febiger, Philadelphia.
- 28) Hoover J.E. Dispensing of Medication, ed Mack Publishing Co., Easton PA.
- 29) Hugo and Russel, Pharmaceutical Microbiology; Blackwell Scientific Publication, Oxford.
- 30) Jellinek JS, Formulation and Function of Cosmetics, John Wiley & Sons, NY.
- 31) Jain N K A Text Book of Forensic Pharmacy, Vallabh Prakashan, Delhi.
- 32) Juliano R L, Drug Delivery Systems, Oxford University Press, Oxford.
- 33) KacChensney J C Packaging of Cosmetics and Toiletries, Newness - Butterworth, London.
- 34) Kielslich K, Ed Biotechnology Vol 6a, Verleg Chemie, Switzerland.
- 35) Lachman L, Lieberman H A and Kanig J L, The Theory and Practice of Industrial Pharmacy, Lea & Febiger, Philadelphia.
- 36) Lea & Fibiger, "Milo Gibaldi, Biopharmaceutics & Clinical Pharmacokinetics", Philadelphia.
- 37) Lea & Fibiger, Pharmaceutical Dosage, Forms and Drug Delivery Systems, Philadelphia.
- 38) Lewin Benjamin, Gene V Microbiology.

- 39) Liberman H A, Rieger M M and Banker G S, "Pharmaceutical Dosage Forms; Dispensing Systems", Vols.1 & 2, Marcel Dekker Inc., NY.
- 40) Liberman H A, Lachman L & Schwartz J B Pharmaceutical Dosage Forms : Tablets.", Vols.1-3, Marcel Dekker Inc., NY.
- 41) Loftus B T and Nash Robert, Pharmaceutical Process Validation, Marcel Dekker Inc., NY.
- 42) MaCabe W L and Smith J C, Unit Operations of Chemical Engineering McGraw Hill International Book Co., London.
- 43) Martin A N, Arthur Cammarata, James Swarbrick, Physical Pharmacy, K M Verghese & Co., Bombay.
- 44) Martin E.W. Dispensing of Medication, Mack Publishing Co., Eastern PA.
- 45) Martindale : The Extra Pharmacopoeia, ed J E F Reynolds, The Pharmaceutical Press, London.
- 46) Merchant H.S and Qadry J.S, Text Book of Hospital Pharmacy, B.S. Shah Prakashan, Ahmedabad.
- 47) Mittal B.M. A Text Book of Forensic Pharmacy, National Book Depot, Calcutta.
- 48) Notari R E, Biopharmaceutics and Pharmacokinetics - an Introduction Marcel Dekker Inc NY.
- 49) Parry R H & Chilton C H Chemical Engineers Handbook, McGraw Kogakusha Ltd.
- 50) Pepler, Microbial Technology, Vol I & II.
- 51) Pharmacopoeia of India, published by the Controller of Publications, Delhi, 1st ed - 1966 - 1985 4th ed-1996.
- 52) Prescott L M, Jarely G P, Klein D A, Microbiology, WmC Borown Publishers, Oxford.
- 53) Prescott and Dunn, Industrial Microbiology, McGraw Hill Book Company Inc.
- 54) Rawlins EA Bentley's Textbook of Pharmaceutics ELBS Bacilliere Tindall.
- 55) Ridgway K Hard Capsules, The Pharmaceutical Press, London.
- 56) Ritschel W A, Handbook of Basic Pharmacokinetics, Drug Intelligence Publications, Hamilton.
- 57) Robinson JR & Lee Vincent, Controlled Drug Delivery : Fundamentals & Applications, Marcel Dekker Inc., NY.
- 58) Rowland M, and Tozer T.N., Clinical Pharmacokinetics, Lea & Febiger, NY.
- 59) Sagarin & balsam M S Cosmetic Science and Technology, Vol 1-3, 2nd ed John Wiley & Sons, NY.
- 60) Salle A J, Fundamental Principles of bacteriology.

- 61) Schroff M L, Professional Pharmacy, Five Star Enterprises, Calcutta.
- 62) Shotton E and Ridgaway K, Physical Pharmaceutics Oxford University Press, London.
- 63) Standury PF & Whitaker A. Principles of Fermentation Technology Pergamon Press, Oxford.
- 64) Stanier R Y, Ingraham, General Microbiology, Wheellis and Painter.
- 65) Stoklosa MJ, Pharmaceutical Calculation, Lea & Febiger, Philadelphia.
- 66) Sykes G, Disinfection and sterilization, II ed.
- 67) The Merck Index, Mark & Co., Inc NJ.
- 68) The British Pharmaceutical Codex, The Pharmaceutical Press, London.
- 69) The United States Pharmacopoeia, The United States Pharmacopoeial Convention, Mack Pub.Co, Easton.PA.
- 70) Thomssen S G, Modern Cosmetics, Universal Publishing Corporation, Bombay.
- 71) Turco S and King R E, Sterile Dosage Forms Lea and Febiger, Philadelphia.
- 72) Wanger J G, Fundamentals of Clinical Pharmacokinetics, Drug Intelligence Publications, Hamilton.
- 73) Wagner J G, Pharmacokinetics for the Pharmaceutical Scientist, Technomic Publishing AG Basel, Switzerland.
- 74) Ward OP Fermentation Technology, Principles, Processes & Products Open University Press, Milton Keynes, UK.
- 75) Winter ME, Basic Clinical Pharmacokinetics, Applied Therapeutics, Inc San Fransisco.
- 76) Welling Peter G and Tse Francis L S, Pharmacokinetics, Marcel Dekke Inc., NY.
- 77) Welling S H, IV, Good Manufacturing Practices for Pharmaceuticals Marcel Dekker Inc NY.
- 78) Zatz Joel L, Pharmaceutical Calculations, John Wiley & Sons, NY.

II. PHARMACOGNOSY :

- 01) Atal C K and Kapur B M, Cultivation and utilization of Medicinal plants, RRL, Jammu.
- 02) Barz W., Reinhard E and Zenk M H, Plant Tissue Culture and Its Biotechnological Application, Springer, Berlin.
- 03) Brain K R and Turner T D the Practical Evaluation of Phytopharmaceuticals, Wright - Scientehnica, Bristol.
- 04) Chadha K L and Gupta R Advances in Horticulture - Vol.

- II- Medicinal and Aromatic Plants, Malhotra Publishing House, New Delhi.
- 05) Chopra R.N., Nayar S L and Chopra, I C, Glosssary of Indian Medicinal Plants, C S I R, New Delhi.
 - 06) Clarke ECG, Isolation and Identification of Drugs, The Pharmaceutical Press, London.
 - 07) De Mayo P, The Chemistry of Natural Products, 2-3, Interscience, New York.
 - 08) Export Potential of Selected Medicinal Plants, prepared by Basic Chemicals, Pharmaceuticals and Cosmetic Export Promotion Council, Bombay, and other reports.
 - 09) Fahn A, Plant Anatomy, 3rd Ed., Pergamon Press, Oxford.
 - 10) Faulkner D J and Fenical W H, Marine Natural Products Chemistry (NATO Conference Series 4), Plenum Press, New York.
 - 11) Gamborg O L and Wetter L R, Plant Tissue Culture Methods, National Research Council of Canada, Saskatchewan.
 - 12) Gibbs R Darneley, Chemotaxonomy of Flowering Plants, 4 Volumes, McGill University Press.
 - 13) Guenther, E, The Essential Oils - 4 D Van Norstand Co Inc., New York.
 - 14) Harbone J B, Biochemistry of Phenolic Compounds, Academic Press, New York.
 - 15) Harbone JB, Phytochemical Methods, Chapman and Hall, International Edition, London.
 - 16) Henry T A, The Plant Alkaloids, McGraw Hill, New York.
 - 17) Kokate C K, Practical Pharmacognosy, Vallabh Prakashan, Delhi.
 - 18) Kokate C K, Purohit A P and Gokhale S B, Pharmacognosy (Degree) Nirali Prakashan, Pune.
 - 19) Manitto P, The Biosynthesis of Natural Products, Ellis Horwood, Chichester.
 - 20) Manske R H F, The Alkaloids, Academic Press, New York.
 - 21) Martindale, The Extra Pharmacopoeia, Pharmaceutical Society of Great Britain, London.
 - 22) Medicinal Plants of India, 1. Indian Council of Medical Research, New Delhi.

- 23) Miller L P, Phytochemistry, 1-3 Van Nostrand Reinhold Co.,
- 24) Nadkarni A.K, Indian Materia Medica, 1-2, Popular Prakashan Pvt.Ltd., Bombay.
- 25) Official Methods of Analysis, Association of Official Analytical Chemists Publications, Washington.
- 26) Peach K., and Tracey M.V., Modern Methods of Plant Analysis, 1-4, Norosa Publishing house, New Delhi.
- 27) Pharmacopoeia of India, 1985, 1996, Govt. of India, Ministry of Health and Family Welfare.
- 28) Pridham J B, and Swain T., Biosynthetic Pathways in Higher Plants, academic Press, New York.
- 29) Pridham J B, Terpenoids in Plants, Academic Press, New York.
- 30) Reinert J and Bajaj Y P S, Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture, Berlin.
- 31) Robinson, T., The Biochemistry of Alkaloids, Springer - Verlag, New York.
- 32) Rosenthaler L, The Chemical Investigations of Plants, G. Bell and Sons limited, London.
- 33) Ross M S F, and Brain K R., An Introduction to Phytopharmacy, Pitman medical, Kent.
- 34) Schellard E J., Practical Plant Chemistry for Pharmacy Students, Pitman Medical, London.
- 35) Scheuer P J., Marine Natural Products, Academic Press, London.
- 36) Shah C S and Quadry J S, Text Book of Pharmacognosy, B.S. Shah Publishers, Ahemadabad.
- 37) Sinnott E.W., Dunn L.C., and Dobzhansky T., Principles of Genetics, Tata Mcgraw Hill Publishing Co., Limited, New Delhi.
- 38) Staba E J, Plant Tissue Culture as a Source of Biomedicinals, CRC Press, Florida.
- 39) Stahl E., Thin Layer Chromatography - A Laboratory Handbook, Springer-Verlag, Berlin.
- 40) Stree H E., Tissue Culture and Plant Science, Academic Press, London.
- 41) Stumpf, P K and Conn E E, The Biochemistry of Plants : A

- Comprehensive Treatise, 1-8, Academic Press.
- 42) Swain T, Chemical Plant Taxonomy, Academic Press, London.
- 43) Swain T., Comparative Phytochemistry, Academic Press, London.
- 44) The Wealth of India, Raw Materials (all volumes) Council of Scientific and Industrial Research, New Delhi.
- 45) Trease G E and Evans W C, Pharmacognosy, Bailliere Tindall, Eastbourne, U K.
- 46) Tyler V C, Brady L R., and Robers J E, Pharmacognosy, Lea and Febiger, Philadelphia.
- 47) Tyler VE Jr and Schwarting AE., Experimental Pharmacognosy, Burgess Pub.Co., Minneaplis, Minnesota.
- 48) United States Pharmacopoeia, United States Pharmacopoeial Convention Inc., Rockville Meddisson.
- 49) Wallis T E, Analytical Microscopy, J & A Churchill limited, London.
- 50) Wallis T E., Text Book of Pharmacognosy, J & A Churchill Limited, London.
- 51) Welsch J R, Fundamentals of Plant Genetics and Breeding, Wiley, New York.
- 52) Whistler R L, Industrial Gums, Polysaccharides and their Derivatives, Academic Press, New York.
- 53) Williams S., Official Methods of Analysis, Association of Official Analytical Chemists Inc., Arlington, Virginia, USA.
- 54) Zafar R, Medicinal Plants of India, C.B.S. Publisher, New Delhi.

III PHYSIOLOGY ANATOMY & HEALTH, PHARMACOLOGY AND CLINICAL PHARMACY :

- 01) Applied Therapeutics : The Clinical Use of Drugs, Applied Therapeutics, Inc.
- 02) Barar F S K, Text Book of Pharmacology, Interprint, New Delhi.
- 03) Best and Taylor's Physiological Basis of Medical Practice, William & Wilkins, Baltimore.
- 04) Chaurasia B D, Human Anatomy, Regional & Applied,

- Part I, II & III, CBS Publishers and Distributors, New Delhi.
- 05) Crossland J and Thomson JH, Essentials of Pharmacology, Harper and Row Publishers NY.
 - 06) Craig C R and Stitzel R R, Modern Pharmacology, Little Brown and Company, 1994.
 - 07) Davidson's Principles and Practice of Medicine, ELBS/Churchill Living Stone.
 - 08) DiFore Lea S H and Febiger, Atlas of Normal Histology, Philadelphia.
 - 09) Ganog W F, Review of Medical Physiology, Prentice Hall International.
 - 10) Ghosh M N, Fundamentals of Experimental Pharmacology, Scientific Book Agency, Calcutta.
 - 11) Goodman and Gilman's, the Pharmacological basis of Therapeutics; Editors : J G Hardman, L E Limbird, P B Molinoss, R W Ruddon and A G Gil, Pergamon Press.
 - 12) Guyton A C, Hall JE, Textbook of Medical Physiology, WB Saunders Company.
 - 13) Herfindal E T and Hirschman J L., Clinical Pharmacy and Therapeutics, Williams and Wilkins.
 - 14) Human Physiology, C C Chatterjee, Medical Allied Agency, Calcutta.
 - 15) Human Physiology, Subhash Shalya, CBS Publishers & Distributors.
 - 16) Katzung, B.G., Basic and Clinical Pharmacology, Prentice hall, International.
 - 17) Keele C A, Neil E and Joels N, Samson Wright's Applied Physiology, Oxford University Press.
 - 18) Kulkarni S.K., Handbook of Experimentals Pharmacology, Vallabh Prakashan Delhi.
 - 19) Laurence, D R and Bennet P.N., Clinical Pharmacology Churchill Livingstone.
 - 20) Mc Naught, A.B. and Callander R., Illustrated Physiology, Churchill livingstone.
 - 21) Mycek M J, Gertner S B and Perper M M, Pharmacology : Lippincott's Illustrated Reviews, Lippincott Company, Philadelphia.

- 22) Paul L., Principles of Pharmacology, Chapman and Hall.
- 23) Parmer N.S., Health Education and Community Pharmacy, CBS Publishers.
- 24) Pharmacotherapy : A Pathophysiological Approach, Dipiro, JL Elsevier.
- 25) Rang MP Dale MM, Riter JM, Pharmacology, Churchill Livingstone.
- 26) Ranade V.G. Text Book of Practical Physiology, Pune Vidyarthi Griha Prakashan, Pune.
- 27) Robbins S L and Kumar V, Basic Pathology, W B Saunders Company.
- 28) Tortora GJ, and Anagnodokos NP, Principles of Anatomy and Physiology Harper & Row Publisher N.Y.
- 29) Theoharides T C, Pharmacology, Little Brown and Co.
- 30) Vander A.J., Sherman J H and Luciano D S Human Physiology, Tata McGraw Hill Publishing Co., New Delhi.

IV. PHARMACEUTICAL ANALYSIS, PHARMACEUTICAL CHEMISTRY, BIOCHEMISTRY.

- 01) Acheson R N, An Introduction to the Chemistry of Heterocyclic Compounds, Interscience Publishers, New York.
- 02) Atherden L M, Bentley and Driver's Textbook of Pharmaceutical Chemistry, Oxford University Press, London.
- 03) Bassett J, Denny R C, Jeffery G H, Mendham J, Vogel's Textbook of Quantitative Inorganic Analysis, ELBS/Longman, London.
- 04) Beckett A H and Stenlake J B, Practical Pharmaceutical Chemistry Vol.I and II., The Athlone Press of the University of London.
- 05) Block J H, Roche E, Sonia T O and Wilson C O, Inorganic Medicinal and Pharmaceutical Chemistry, Lea and Febiger, Philadelphia PA.
- 06) Brey W.S, Physical Chemistry and its Biological Applications, Academic press.
- 07) Chatten L G, A Textbook of Pharmaceutical Chemistry, Vol. I & II Marcel Dekker, New York.
- 08) Conn E E and Stumpf P K, Outlines of Biochemistry, John Wiley and Sons, New York.
- 09) Connors K A, A Textbook of Pharmaceutical Analysis,

- Wiley Interscience, New York.
- 10) Delgado J N and Remers W A R, Eds., Wilson and Giswold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, J. Lippincott Co., Philadelphia.
 - 11) Discher LA, Modern Inorganic Pharmaceutical Chemistry.
 - 12) Eliel E L, Stereochemistry of Carbon Compounds, McGraw Hill book Company, Inc., New York.
 - 13) Exploring QSAR : Vol. I Fundamentals and Applications in Chemistry and Biology by C Hansh and A Leo Vol.II : Hydrophobic, Electronic and Steric constants by C Hansh, A Leo and D Hockmon ACS Book Catalog.
 - 14) Final I.L., Organic Chemistry, Vol-I. The Fundamentals & Principles ELBS / Longman.
 - 15) Finar I L, Organic Chemistry, Vol.II ELBS/Longman, London.
 - 16) Foye W C, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
 - 17) Furniss B.S., Hannaford A.J., Smith P.W.G. and Tatehell A.R., Vogel's Textbook of Practical Organic Chemistry, The ELBS/Longman, London.
 - 18) Hansh C, Comprehensive Medicinal Chemistry, Vol.IV, Quantitative Drug Design, Pergamon Press, Oxford.
 - 19) Harrow B and Mazur A, Textbook of Biochemistry, W B Saunders Co., Philadelphia.
 - 20) Jayaraman J, Laboratory Manual in Biochemistry, Wiley Eastern Limited, New Delhi.
 - 21) Jurs P C, Computer Software Application in Chemistry, John Wiley & Sons, New York.
 - 22) Kolthoff I M and Stenger V A, Volumetric Analysis, Vol. II Titration Methods, Interscience Publishers, Inc., New York.
 - 23) Kitekenner J A, Findley's Physical Chemistry, (Ed) Green & Co., London.
 - 24) Knevel A M and Digangi F E, Jenkin's Quantitative Pharmaceutical Chemistry, McGraw Hill Book Co., New York.
 - 25) Laidler K.J., Physical Chemistry with Biological Applications, Benjman.
 - 26) Lehninger A L, Biochemistry, Worth Publisher, Inc.,

- 27) Lehninger A L, Principles of Biochemistry, CBS Publishers and Distributors.
- 28) Ladu B.N., Mandel H G and Way E L., Fundamentals of Drug Metabolism and Disposition, William and Welkins Co, 428 E, Preston Street, Baltimore.
- 29) Mann F C, and Saunders B C, Practical Organic Chemistry, The English Language Book Society and logman Group limited, London.
- 30) Martin Y. C, Quantitative Drug Design - A Critical Introduction (Medicinal Research Monograph, Vol 8) Marcel Dekkes, Inc. New York.
- 31) Wallwork SC, Physical Chemistry for Students of Pharmacy and Biology, Longman.
- 32) Morrison T R and Boyd R N, Organic Chemistry, Prentice Hall of India, Private limited, New Delhi.
- 33) Martin D W, Mays P A and Redwell VM, Harpers Biochemistry, Lange Medical Publications.
- 34) Mussay RK, Granner DK, Mayos PA and Rodwell VW., Harpers Biochemistry, Prentice-Hall International, INC.
- 35) Nogrady T, Medicinal Chemistry, - A Biochemical Approach, Oxford University Press, New York, Oxford.
- 36) Pali S R and Prabartak S K D E, Pretical Physical Chemistry, Haltone Limited, Calcutta.
- 37) Plumer DT. An introduction to Practical Biochemistry, Tata McGraw Hill, New Delhi.
- 38) Pops and Perruns, Computer Aided Drug Design, Academic Press, NY.
- 39) Qadru JS and Qadry S Z, Text book of Inorganic Pharmaceutical and Medicinal Chemistry, B.S. Shah Prakashan, Ahmedabad.
- 40) Roberts J D and Caserio M C, Basic Principles of Organic Chemistry, W A Benjamin, Inc., New York.
- 41) Reynolds J E F, Martindale, The Extra Pharmacopoeia, The Pharmaceutical Press, London.
- 42) Stryer L, Biochemistry, W H Freeman and Company, San Fransisco.
- 43) Suchla G., Vogel's Textbook of Micro and Semimicro Qualitative Inorganic Analysis, Orient Longman, Hyderabad.

- 44) Sykes P, A Guidebook to Mechanism in Organic Chemistry, Orient longman, New Delhi.
- 45) Singh Harkishan and Kapoor, V.K., Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
- 46) Vogel A I, A Text Book of practical organic chemistry, The English language book society and longman group limited, London.
- 47) Shoemaker D.P., Garland C.W., Experiments in Physical Chemistry, McGraw Hill Book Co., New York.
- 48) Wolff M E, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.
- 49) Williams V R and Williams H S, Basic Physical Chemistry for the Life Sciences, W H Freeman.

V BASIC ELECTRONICS & COMPUTER APPLICATIONS.:

- 01) Grogona P, Programming in Pascal, Adeison Wesley, Reading, M.A.
- 02) Hunt N and Shelley J.Computers and Commonsense, Prentice - Hall of India, New Delhi.
- 03) Jensen K and Wirth N., Pascal User Mannual and Report, Narosa Publishing House, New Delhi.
- 04) Popst and Perrum " Computer Aided Drug Design", Academic Press, New York.
- 05) Rajaraman V, Computer Programming in Pascal, Prentice-Hall of India, New Delhi, 1983.
- 06) Wirth N, Systematic Programming an Introduction, Prentice Hall Englewood Cliff's New Jersey.

VI MATHEMATICS:

- 01) A text book of mathematics for XI-XII students, NCERT Publications, Vol.I-IV
- 02) Boltions, Pharmaceutical Statistics, Practical and Clinical Applications, Marcel Dekker, N. Y.
- 03) Daniel W W, Biostatistics. A Foundation for Analysis in Health Sciences, John Wiley, N Y.
- 04) Grewal B S, Higher Engineering Mathematics, Khanna Publishers, New Delhi.
- 05) Gupta S P, Statistical Methods, Sultan Chand & Co., New Delhi.
- 06) Schaum, Differential Equations, McGraw-Hill Singapore.

Appendix-A

Scheme for First Examination for the Degree of Bachelor of Pharmacy.

Sr. No.	Subject	Maximum Marks			Minimum Marks for Passing	Time in Hours allowed for examination
		Sessional	Paper or Practical	Total		
1.	2.	3.	4.	5.	6.	7.
	Theory Papers					
1.	I.T.1 General & Dispensing Pharmacy	20	80	100	45	3
2.	I.T.2 Pharmaceutical Chemistry-I (Inorganic)	20	80	100	45	3
3.	I.T.3 Pharmaceutical Chemistry-II (Organic)	20	80	100	45	3
4.	I.T.4 Pharmacognosy-I	20	80	100	45	3
5.	I.T.5 Anatomy & Physiology	20	80	100	45	3
6.	I.T.6 Pharmaceutical Microbiology	20	80	100	45	3
7.	I.T.7 Mathematics & Statistics	20	80	100	45	3
	Practicals :					
8.	I.P.1 General & Dispensing Pharmacy	20	80	100	50	6
9.	I.P.2 Pharmaceutical Chemistry-I (Inorganic)	20	80	100	50	6
10.	I.P.3 Pharmaceutical Chemistry-II (organic)	20	80	100	50	6
11.	I.P.4 Pharmacognosy-I	20	80	100	50	6
12.	I.P.5 Anatomy & Physiology	20	80	100	50	6

Notes :

- 1) In Order to pass, the examinee must obtain minimum pass marks as indicated above.
- 2) The sessional marks in theory will normally be based on an average of best two of the three tests conducted during the academic year by the teacher/s before University examination.
- 3) The sessional marks in practicals shall be allotted on the following basis.
 - i) Actual performance in the sessional examination - 10 Marks
 - ii) Day to day in practical work - 10 Marks
- (4) Practical examination shall consists of :
 - i) Practical - 60 Marks
 - ii) Viva-voce (oral) - 20 Marks

Appendix-B

Scheme for Second Examination for the Degree of Bachelor of Pharmacy.

Sr. No.	Subject	Maximum Marks			Minimum Marks for Passing	Time in Hours allowed for examination
		Sessional	Paper or Practical	Total		
1.	2.	3.	4.	5.	6.	7.
	Theory Papers					
1.	II.T.1 Physical Pharmacy	20	80	100	45	3
2.	II.T.2 Pharmaceutical Unit Operation	20	80	100	45	3
3.	II.T.3 Pharmaceutical Analysis-I	20	80	100	45	3
4.	II.T.4 Pharmaceutical Chemistry-III (Heterocyclic & Natural Products)	20	80	100	45	3
5.	II.T.5 Biochemistry	20	80	100	45	3
6.	II.T.6 Pharmacology-I	20	80	100	45	3
7.	II.T.7 Basic Electronics & Computer Applications	20	80	100	45	3
	Practicals :					
8.	II.P.1 Physical Pharmacy	20	80	100	50	6
9.	II.P.2 Pharmaceutical Analysis-I	20	80	100	50	6
10.	II.P.3 Pharmaceutical Chemistry-III (Heterocyclic & Natural Products)	20	80	100	50	6
11.	II.P.4 Biochemistry	20	80	100	50	6
12.	II.P.5 Pharmacology-I	20	80	100	50	6

Notes :

- 1) In Order to pass, the examinee must obtain minimum pass marks as indicated above.
- 2) The sessional marks in theory will normally be based on an average of best two of the three tests conducted during the academic year by the teacher/s before University examination.
- 3) The sessional marks in practicals shall be allotted on the following basis.
 - i) Actual performance in the sessional examination - 10 Marks
 - ii) Day to day in practical work - 10 Marks
- (4) Practical examination shall consists of :
 - i) Practical - 60 Marks
 - ii) Viva-voce (oral) - 20 Marks

Appendix-C

Scheme for Third Examination for the Degree of Bachelor of Pharmacy.

Sr. No.	Subject	Maximum Marks			Minimum Marks for Passing	Time in Hours allowed for examination	
		Sessional	Paper or Practical	Total			
1.	2.	3.	4.	5.	6.	7.	
	Theory Papers						
1.	III.T.1	Hospital Pharmacy	20	80	100	45	3
2.	III.T.2	Industrial Pharmacy	20	80	100	45	3
3.	III.T.3	Pharmaceutical Biotechnology	20	80	100	45	3
4.	III.T.4	Medicinal Chemistry-I	20	80	100	45	3
5.	III.T.5	Pharmacognosy-II	20	80	100	45	3
6.	III.T.6	Pharmacology-II	20	80	100	45	3
7.	III.T.7	Pharmaceutical Jurisprudence & Business Management	20	80	100	45	3
	Practicals :						
8.	III.P.1	Hospital Pharmacy	20	80	100	50	6
9.	III.P.2	Pharmaceutical Biotechnology	20	80	100	50	6
10.	III.P.3	Medicinal Chemistry-I	20	80	100	50	6
11.	III.P.4	Pharmacognosy-II	20	80	100	50	6
12.	III.P.5	Pharmacology-II	20	80	100	50	6

Notes :

- 1) In Order to pass, the examinee must obtain minimum pass marks as indicated above.
- 2) The sessional marks in theory will normally be based on an average of best two of the three tests conducted during the academic year by the teacher/s before University examination.
- 3) The sessional marks in practicals shall be allotted on the following basis.
 - i) Actual performance in the sessional examination - 10 Marks
 - ii) Day to day in practical work - 10 Marks
- 4) Practical examination shall consists of :
 - i) Practical - 60 Marks
 - ii) Viva-voce (oral) - 20 Marks

Appendix-D

Scheme for Final Examination for the Degree of Bachelor of Pharmacy.

Sr. No.	Subject	Maximum Marks			Minimum Marks for Passing	Time in Hours allowed for examination	
		Sessional	Paper or Practical	Total			
1.	2.	3.	4.	5.	6.	7.	
Theory Papers							
1.	IV.T.1	Community Pharmacy	20	80	100	45	3
2.	IV.T.2	Clinical Pharmacy & Pathology	20	80	100	45	3
3.	IV.T.3	Biopharmaceutics & Pharmacokinetics	20	80	100	45	3
4.	IV.T.4	Industrial Pharmacy-II	20	80	100	45	3
5.	IV.T.5	Medicinal Chemistry-II	20	80	100	45	3
6.	IV.T.6	Pharmaceutical Analysis-II	20	80	100	45	3
7.	IV.T.7	Pharmacognosy-III	20	80	100	45	3
Practicals :							
8.	IV.P.1	Community Pharmacy	20	80	100	50	6
9.	IV.P.2	Industrial Pharmacy-II	20	80	100	50	6
10.	IV.P.3	Medicinal Chemistry-II	20	80	100	50	6
11.	IV.P.4	Pharmaceutical Analysis-II	20	80	100	50	6
12.	IV.P.5	Pharmacognosy-III	20	80	100	50	6

Notes :

- 1) In Order to pass, the examinee must obtain minimum pass marks as indicated above.
- 2) The sessional marks in theory will normally be based on an average of best two of the three tests conducted during the academic year by the teacher/s before University examination.
- 3) The sessional marks in practicals shall be allotted on the following basis.
 - i) Actual performance in the sessional examination - 10 Marks
 - ii) Day to day in practical work - 10 Marks
- 4) Practical examination shall consists of :
 - i) Practical - 60 Marks
 - ii) Viva-voce (oral) - 20 Marks

SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

- Ordinance No. 1 : Enrolment of Students.
- Ordinance No. 2 : Admission of Students
- Ordinance No. 4 : National cadet corps
- Ordinance No. 6 : Examinations in General (relevent extracts)
- Ordinance No. 18/2001 : An Ordinance to provide grace marks for passing in a Head of passing and Improvement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute NO.18, Ordinance 2001.
- Ordinance No. 9 : Conduct of Examinations (relevent extracts)
- Ordinance No. 10 : Providing for Exemptions and Compartments
- Ordinance No. 19 : Admission of Candidates to Degrees.
- Ordinance No. 109 : Recording of a change of name of a University student in the records of the University.

- Ordinance No. 138 : For improvement of Division/Grade.
- Ordinance No.19/2001 : An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dr.K.G.Khamare
Registrar
Sant Gadge Baba Amravati University

Index

Sr. No.	Subject	Page No.
1.	Special note for the information of the students	1 to 2
2.	Ordinance No.153	3 to 8
3.	Regulation No. 24 of 2003	8 to 12
4.	General and Dispensing Pharmacy	13 to 14
5.	Pharmaceutical Chemistry-I (Inorganic)	14 to 16
6.	Pharmaceutical Chemistry-II (Organic)	16 to 17
7.	Pharmacognosy-I	17 to 19
8.	Anatomy & Physiology	19 to 23
9.	Pharmaceutical Microbiology	23 to 24
10.	Mathematics & Statistics	24 to 25
11.	Additional Books Recommended	26 to 37
