



Shri Shankaracharya Technical Campus

Shri Shankaracharya Group of Institutions

Faculty of Pharmaceutical Sciences

(An Autonomous Institute affiliated to Chhattisgarh Swami Vivekananda Technical University, Bhilai)

SCHEME OF EXAMINATION AND SYLLABUS (Effective from 2020-2021 Batch)

Bachelor in Pharmacy Third Year (6th semester)

Subject code PH108601	Medicinal Chemistry – III – Theory	L=3	T =1	P =0	Credits= 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	75	15	10	100	3 Hours

Course Objective	Course Outcomes
Objectives: Upon completion of the course student shall be able to 1. Understand the importance of drug design and different techniques of drug design. 2. Understand the chemistry of drugs with respect to their biological activity. 3. Know the metabolism, adverse effects and therapeutic value of drugs. 4. Know the importance of SAR of drugs	CO1- Describe the chemistry of drugs with respect to their biological activity CO2- Explain the chemistry of drugs with respect to their biological activity CO3- Relate the chemistry of drugs with respect to their biological activity. CO4- Understand the importance of drug design and different techniques of drug design.

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UNIT – I

10 Hours

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structureactivity relationship, Chemical degradation classification and important products of the following classes.

β-Lactam antibiotics: Penicillin, Cephalosporins, β- Lactamase inhibitors, Monobactams

Aminoglycosides: Streptomycin, Neomycin, Kanamycin

Tetracyclines: Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

UNIT – II

10 Hours

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structureactivity relationship, Chemical degradation classification and important products of the following classes

Macrolide: Erythromycin, Clarithromycin, Azithromycin.

Miscellaneous: Chloramphenicol*, Clindamycin.

Prodrugs: Basic concepts and application of prodrugs design.

Antimalarials: Etiology of malaria.

Quinolones: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine.

Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil.

Miscellaneous: Pyrimethamine, Artesunate, Artemether, Atovaquone.

UNIT – III

10 Hours

Anti-tubercular Agents

Synthetic anti tubercular agents: Isoniazid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*

Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine, Streptomycin, Capreomycin sulphate.

Urinary tract anti-infective agents

Quinolones: SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

Antiviral agents:

Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine,

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Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.

UNIT – IV

08 Hours

Antifungal agents:

Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Synthetic Antifungal agents: Clotrimazole, Econazole,

Butoconazole, Oxiconazole, Tioconazole, Miconazole*, Ketoconazole,

Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.

Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole,

Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.

Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole,

Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantel, Ivermectin.

Sulphonamides and Sulfones

Historical development, chemistry, classification and SAR of Sulfonamides:

Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*,

Sulphapyridine, Sulfamethoxazole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole.

Sulfones: Dapsone*.

UNIT – V

07 Hours

Introduction to Drug Design

Various approaches used in drug design.

Physicochemical parameters used in quantitative structure activity

relationship (QSAR) such as partition coefficient, Hammett's electronic

parameter, Taft's steric parameter and Hansch analysis.

Pharmacophore modelling and docking techniques.

Combinatorial Chemistry: Concept and applications of combinatorial

chemistry: solid phase and solution phase synthesis.

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Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Principal of Medicinal chemistry	Dr. S.S. Kadam Dr. K.R. mahadik	1 st	Nirali prakashan
2	Medicinal chemistry	Ashutos kar	1st	New age international limited publisher

Reference books:

S. No.	Title	Authors	Edition	Publisher
1	Text book of medicinal chemistry	Prof surendra nath pandey	3rd	S.G. publisher

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Subject code PH108691	Medicinal Chemistry – III – Practical	L=3	T =1	P =0	Credits= 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	50				3 Hours

I Preparation of drugs and intermediates

- 1 Sulphanilamide
- 2 7-Hydroxy, 4-methyl coumarin
- 3 Chlorobutanol
- 4 Triphenyl imidazole
- 5 Tolbutamide
- 6 Hexamine

II Assay of drugs

- 1 Isonicotinic acid hydrazide
- 2 Chloroquine
- 3 Metronidazole
- 4 Dapsone
- 5 Chlorpheniramine maleate
- 6 Benzyl penicillin

III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique

IV Drawing structures and reactions using chem draw®

V Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)

S.No.	Title	Authors	Edition	Publisher
1	Experimental organic & medicinal chemistry	Biren N. shah	1 st	PV publisher

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SCHEME OF EXAMINATION AND SYLLABUS (Effective from 2020-2021 Batch)

Bachelor in Pharmacy Third Year (6th semester)

Subject code PH108602	Pharmacology – III – Theory	L=3	T=1	P=0	Credits= 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	75	15	10	100	3 Hours

Course Objective	Course Outcomes
Objectives: Upon completion of this course the student should be able to: 1. understand the mechanism of drug action and its relevance in the treatment of different infectious diseases 2. comprehend the principles of toxicology and treatment of various poisonings 3. appreciate correlation of pharmacology with related medical sciences.	CO1- Understand the classification and pharmacological action of drugs used in respiratory and gastro intestinal tract disease. CO2- Describe pharmacology of various chemotherapeutic agent CO3- Explain different aspect of malignancy ,anticancer drugs and immunomodulators CO4- To study the basic principles of toxicology and chronopharmacology.

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UNIT-I

10 hours

1. Pharmacology of drugs acting on Respiratory system

- Anti-asthmatic drugs
- Drugs used in the management of COPD
- Expectorants and antitussives
- Nasal decongestants
- Respiratory stimulants

2. Pharmacology of drugs acting on the Gastrointestinal Tract

- Antiulcer agents.
- Drugs for constipation and diarrhoea.
- Appetite stimulants and suppressants.
- Digestants and carminatives.
- Emetics and anti-emetics.

UNIT-II

10 hours

3. Chemotherapy

- General principles of chemotherapy.
- Sulfonamides and cotrimoxazole.
- Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolones, tetracycline and aminoglycosides

UNIT-III

10 hours

3. Chemotherapy

- Antitubercular agents
- Antileprotic agents
- Antifungal agents
- Antiviral drugs
- Anthelmintics
- Antimalarial drugs
- Antiamoebic agents

UNIT-IV

08 hours

3. Chemotherapy

- Urinary tract infections and sexually transmitted diseases.
- Chemotherapy of malignancy.

4. Immunopharmacology

- Immunostimulants
- Immunosuppressant

Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars

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UNIT-V

07 hours

5. Principles of toxicology

- Definition and basic knowledge of acute, subacute and chronic toxicity.
- Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity
- General principles of treatment of poisoning
- Clinical symptoms and management of barbiturates, morphine, organophosphorus compound and lead, mercury and arsenic poisoning.

6. Chronopharmacology

- Definition of rhythm and cycles.
- Biological clock and their significance leading to chronotherapy.

Text Books:

S.N o.	Title	Authors	Edition	Publisher
1	Essential of medicinal pharmacology	K.d. tripathi	6th	Jaypee brother medical publisher
2	Basic and clinical pharmacology	Bentham and susan b. mastene	11 th	Tata mcgnaw education pvt limited

Reference books:

S. No.	Title	Authors	Edition	Publisher
1	A text book of pharmacology	Dr. Madan Kaushik	1 st	S. vikas and company (medical publisher)
2	Elements of pharmacology	Dr. Ramesh k. goyal	18 th	B.S shah Prakashan

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Subject code PH108692	Pharmacology – III – Practical	L=3	T =1	P =0	Credits= 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
					3 Hours

Practicals-

1. Dose calculation in pharmacological experiments
2. Antiallergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using semi- autoanalyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens (rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology(student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

**Experiments are demonstrated by simulated experiments/videos*

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Experiment and pharmacolgy	S.K. kulkarni	4 th	Vallabh prakashan

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SCHEME OF EXAMINATION AND SYLLABUS (Effective from 2020-2021 Batch)

Bachelor in Pharmacy Third Year (6th semester)

Subject code PH108603	Herbal Drug Technology – Theory	L=3	T=1	P=0	Credits= 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	75	15	10	100	3 Hours

Course Objective	Course Outcomes
Objectives: Upon completion of this course the student should be able to: 1. Understand the raw material as a source of herbal drugs from cultivation to herbal drug product 2. know the WHO and ICH guidelines for evaluation of herbal drugs 3. know the herbal cosmetics, natural sweeteners, nutraceuticals 4. Appreciate patenting of herbal drugs, GMP.	CO1- Recognize and compile the cultivation and collection of herbal drugs and their implications in alternative system of medicines. CO2- Generate and deduce various herbal formulations and their interactions. CO3- Infer, apply and appraise the WHO and ICH guidelines for evaluation of herbal drugs. CO4- Value and appraise the patenting of herbal drugs and GMP.

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UNIT-I

06 Hours

Herbs as raw materials

Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation Source of Herbs
Selection, identification and authentication of herbal materials processing of herbal raw material

Biodynamic Agriculture

Good agricultural practices in the cultivation of medicinal plants including Organic farming.
Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

UNIT-II

05 Hours

- a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy
b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika, Churna, Lehya and Bhasma.

UNIT-III

07 Hours

Nutraceuticals

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.

Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

UNIT-IV

10 Hours

Herbal Cosmetics

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients:

Herbal Excipients – Significance of substances of natural origin as excipients – colourants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavours & perfumes.

Herbal formulations :

Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

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UNIT- V

10 Hours

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drug stability testing of herbal drugs.

Patenting and Regulatory requirements for natural products:

- a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy
- b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.

Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

UNIT-VI

07 Hours

General Introduction to Herbal Industry

Herbal drugs industry: Present scope and future prospects.

A brief account of plant-based industries and institutions involved in work on medicinal and aromatic plants in India.

Schedule T–Good Manufacturing Practice of Indian systems of medicine

Components of GMP (Schedule – T) and its objectives

Infrastructural requirements, working space, storage area, machinery and equipment, standard operating procedures, health and hygiene, documentation and records.

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Pharmacognosy	C.K. kokate and A.Pwolit	41th	Nirali publication
2	A textbook of pharmacognosy and phytochemistry	Biren shah and AK seth	2nd	CBS publishers and distributors pvt ltd

Reference books:

S. No.	Title	Authors	Edition	Publisher
1	Essential of pharmacognosy	Dr. S.H Ansari	8th	Birla publication
2	Text book of pharmacognosy	T.E. wallis	5th	CBS publisher

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Subject code PH108693	Herbal Drug Technology – Practical	L=3	T =1	P =0	Credits= 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
					3 Hours

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of Ash value
3. Determination of moisture content of crude drugs
4. Determination of Extractive values of crude drugs
5. Determination of the alcohol content of Asava and Arista
6. Preparation of herbal cosmetics
7. Preparation and standardization of herbal formulation
8. Determination of swelling index and foaming index
9. Monograph analysis of herbal drugs from recent Pharmacopoeias
10. Analysis of fixed oils

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Practical Pharmacognosy	Rasheeduz zeefar & neenja gandhi	1 st	CBS publishers and distributors pvt ltd

Reference books:

S. No.	Title	Authors	Edition	Publisher
1	Practical Pharmacognosy	C.K. kokate	5th	Vallabh prakashan

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Subject code PH108604	Biopharmaceutics and Pharmacokinetics–Theory	L=3	T =1	P =0	Credits= 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	75	15	10	100	3 Hours

Course Objective	Course Outcomes
Objectives: Upon completion of the course student shall be able to: 1. Understand the basic concepts in biopharmaceutics and pharmacokinetics. 2. Use plasma data and derive the pharmacokinetic parameters to describe the process of drug absorption, distribution, metabolism and elimination. 3. Critically evaluate biopharmaceutic studies involving drug product equivalency 4. Design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters. 5. detect potential clinical pharmacokinetic problems and apply basic pharmacokinetic principles to solve them.	CO1- Assess the Biopharmaceutics and Pharmacokinetics and their role in formulation development and clinical setting. CO2- Interpret plasma drug concentration measurement by the application of compartment model. CO3- Estimate the Non-linear pharmacokinetics with special reference to its assessment. CO4-Analyze the clinical significance of bioavailability and bioequivalence.

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UNIT-I Introduction to Biopharmaceutics Absorption; Mechanisms of drug absorption through GIT, factors influencing Drug absorption through GIT, absorption of the drug from Non per oral extra-vascular routes, Distribution of drugs Tissue permeability of drugs, binding of drugs, apparent, the volume of drug distribution, protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs.	10 Hours
UNIT- II Drug Elimination renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non-renal routes of drug excretion of drugs Bioavailability and Bioequivalence: Objectives of bioavailability studies, absolute and relative bioavailability, measurement of bioavailability, in-vitro drug dissolution models, in-vitro, in-vivo correlations, bioequivalence studies, methods to enhance the bioavailability.	10 Hours
UNIT- III Pharmacokinetics: Introduction to Pharmacokinetics models, Compartment models, Non-compartment models, physiological models, One compartment open model. a. Intravenous Injection (Bolus) b. Intravenous infusion, extra vascular administrations, calculations of K_a , K_E . From plasma and urinary excretion data	10 Hours
UNIT- IV Multi compartment models: Two compartment open model. IV bolus Multiple – Dosage Regimens: a). Repetitive Intravenous injections – One Compartment Open Model b). Repetitive Extra vascular dosing – One Compartment Open model	08 Hours
UNIT- V Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity.c. Michaelis-menton method of estimating parameters, Biotransformation of drugs	07 Hours

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Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Biopharmaceutics & Pharmacokinetics treatise	D.M. Brahmkal & sunil b jaiswal	1 st	Vallabh prakashan

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SCHEME OF EXAMINATION AND SYLLABUS (Effective from 2020-2021 Batch)

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Subject code PH108605	Pharmaceutical Biotechnology– Theory	L=3	T =1	P =0	Credits= 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	75	15	10	100	3 Hours

Course Objective	Course Outcomes
Upon completion of the subject student shall be able to; 1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries 2. Genetic engineering applications in relation to production of pharmaceuticals 3. Importance of Monoclonal antibodies in Industries 4. Appreciate the use of microorganisms in fermentation technology	CO1- Describe the pharmaceutical production of recombinant proteins, insulin, growth hormones, interferon, monoclonal antibodies through application of rDNA technology CO2- Explain the principle, detail the technique and application of plant and animal cell/ tissue culturing CO3- Outline construction, type, working of fermenter and explain in-situ recovery of fermentation products CO4- Explain tools and techniques of rDNA technology.

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Unit I

10 Hours

- A brief introduction to Biotechnology with reference to Pharmaceutical Sciences.
- Enzyme Biotechnology- Methods of enzyme immobilization and applications.
- Biosensors- Working and applications of biosensors in Pharmaceutical Industries.
- A brief introduction to Protein Engineering.
- Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.
- Basic principles of genetic engineering.

Unit II

10 Hours

- Study of cloning vectors, restriction endonucleases and DNA ligase.
 - Recombinant DNA technology. Application of genetic engineering in medicine.
 - Application of r DNA technology and genetic engineering in the products:
 - Interferon b) Vaccines- hepatitis- B c) Hormones- Insulin.
 - Brief introduction to PCR
- Types of immunity- humoral immunity, cellular immunity

Unit III

10 Hours

- Structure of Immunoglobulins
- Structure and Function of MHC
- Hypersensitivity reactions, Immune stimulation and Immune suppressions.
- General method for the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.
- Storage conditions and stability of official vaccines
- Hybridoma technology- Production, Purification and Applications

Unit IV

08Hours

- Immuno blotting techniques- ELISA, Western blotting, Southern blotting.
- Genetic organization of Eukaryotes and Prokaryotes
- Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.
- Introduction to Microbial biotransformation and applications.
- Mutation.

Unit V

07 Hours

- Types of mutation/mutants
- Fermentation methods and general requirements, the study of media, equipment,

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Shri Shankaracharya Group of Institutions

Faculty of Pharmaceutical Sciences

(An Autonomous Institute affiliated to Chhattisgarh Swami Vivekananda Technical University, Bhilai)

SCHEME OF EXAMINATION AND SYLLABUS (Effective from 2020-2021 Batch)

Bachelor in Pharmacy Third Year (6th semester)

Sterilization methods, aeration process, stirring.

c) Large scale production fermenter design and its various controls.

d) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Biotechnology	U Satyanarayana	1st	Uppala author publisher
2	Pharmaceutical biotechnology	S.P. Vyas V.K.Dixit	1st	CBS publisher and distributor

Reference books:

S. No.	Title	Authors	Edition	Publisher
1	Pharmaceutical biotechnology fundamentals & application	S.S. kori M.A. halkai	1 st	Vallabh prakashan

		October 2020	1.00	Applicable for AY 2020-21 Onwards
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