JSS Academy of Higher Education and Research

JSS College of Pharmacy

Sri Shivarathreeshwara Nagar, Mysuru-570015

Ph: 0821-2548353, Fax: 0821-2548359, Email: jsscpmy@jssuni.edu.in

Website: www.jsspharma.org

An ISO 9001:2008 Certified Institution

JSS ACADEMY OF HIGHER EDUCATION & RESEARCH

(DEEMED TO BE UNIVERSITY) MYSURU

Accredited 'A' Grade by NAAC

Course Handout

2017-18

Class: B. Pharm – IV Semester

Name : _____

Roll No. : _____

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VISION

To be a leader in pharmaceutical sciences & pharmacy practice education, training, research and continuous professional development for pharmacists and Pharmaceutical Scientists providing competent patient care and nurturing drug discovery and development.

MISSION

- To impart knowledge, develop skills and competencies in students in pharmaceutical sciences and pharmacy practice.
- Develop and advance the knowledge, attitude and skills of pharmacists and faculty members who can provide comprehensive pharmaceutical care to patients, improve patient outcomes, and meet societal needs for safe and effective drug therapy.
- To develop, promote and nurture research activities in pharmaceutical sciences and pharmacy practice and translating research into healthcare

CORE VALUES

- Innovation, Leadership, Excellence, Integrity, Respect, Professionalism

Academic Calendar 2017-18
(B.Pharm - VI Semester)

1. **Commencement of Classes**

   B.Pharm – VI Semester - 04th December, 2017

2. **Sessional Examination Schedule**

I	II
14, 15, 16 & 17th Feb 2018	20, 21, 22, 24 & 25th April 2018

3. **Closure of Term** - 25th April, 2018
4. **Annual Examination** - 7th May, 2018
5. **Annual Vacation** - From 25th May' 2018 to 24th June 2018

Teacher's Incharge

Class	Class Teacher	Batch No.	Batch Teacher
III B.Pharm VI Semester	Dr. A. Muthuraman	I	Dr. A. Muthuraman
		II	Dr. B.M. Gurupadayya
		III	Dr. K. Mruthunjaya
		IV	Dr. Amit B. Patil

ACTIVITIES AND COORDINATORS 2017-18

Curricular & Co curricular activities

Sl. No	Activities	Coordinators	Schedule
1.	Induction, learning skills and personality development programmes for fresher's	DHPG	First Week of Commencement of First year of each course
2.	Anti ragging cell	JS/AMM/JUS	June 17 - May 18
3.	Grievance and redressal cell	PKK	June 17 - May 18
4.	Industrial Visits, Training and placements	MNP/TMP/ABP	June 17 - May 18
5.	Guest lectures &Seminars/conferences/training/workshop • organized at college • delivered/attended by staff	HVG	June 17 - May 18
6.	Internal Assessment Committee Chairperson Members	 GVP KM/RSS/SNM/BMV	June 17 - May 18
7.	• Academic Council Board • Identification of Advanced/ Medium/ Slow learners	Class Teachers	June 17 - May 18
8.	Ethics committee Meeting • Animal • Human	 KLK MR	June 17 - May 18
9.	Time table	MSV/UM/AKT/HKS /AMR/NPK	June 17 - May 18
10.	IQAC	MNP/VKG/VJ/ AMM/JL	June 17 - May 18
11.	Women's cell (Prevention of Sexual Harassment Cell)	MNN	June 17 - May 18
12.	Scholarship Bureau	RSC	June 17 - May 18
13.	Compilation of publications (Research papers/books/chapters)	BMG	June 17 - May 18
14.	Research Review Committee -Compilation of Ph.D details and funded projects - Plagiarism - Review of publications	Chairperson – DVG Members – BMG/BRP/HVG/KU	June 17 - May 18
15.	Pharmacy Education Unit (CCLPE)	PKK/KU/AMR	June 17 - May 18
16.	Admission Facilitation Cell	TMP/BV/JS/HP	June 17 - May 18
17.	Annual result analysis List of merit students	Exam section/ Program committee	June 17 - May 18

18.	GPAT and other competitive exams (TOEFL, GRE etc.)	AMM	June 17 - May 18
19.	Innovative Pedagogy	Pharmacy Education Unit	June 17 - May 18
20.	Library orientation	NS	June 17 - May 18
21.	Soft Skills Training	VKG	June 17 - May 18

Program Committee

Sl. No.	Program	Chairperson	Member Secretary	Schedule
22.	D.Pharm	TMP	BMV	June 17 - May 18
23.	B.Pharm	PKK	KM	June 17 - May 18
24.	Pharm.D	MR	RSS	June 17 - May 18
25.	M.Pharm	TMP	SNM	June 17 - May 18

Extracurricular activities

Sl. No.	Activities	Coordinators	Schedule
26.	• Selection of Class Representatives, Pharmaceutical society members • Annual planning and execution of Student centered and professional activities including inauguration of IPS	AKT	Within a month of Commencement of course June 17 - May 18
27.	JASPHARM	BMV	June 17 - May 18
28.	STUMAG	JUS	June 17 - May 18
29.	Sports coordinators	KLK/JK/NPK	June 17 - May 18
30.	NSS coordinators	BRJ/MPG	June 17 - May 18
31.	Cultural & Literary coordinators	MNN/SP/RSC	June 17 - May 18

Other Institutional activities

Sl. No.	Activities	Coordinators	Period
32.	Annual Day celebration	HVG/SM	March 2018
33.	Course handouts/ Teachers diary/ Student handbook/faculty handbook	MPV/RSC	June 2017
34.	National Pharmacy Week (NPW) & Pharmacists Day	UM + IPA team	Nov 2017
35.	Alumni association	TMP/SM/BS	June 17 - May 18
36.	Herbal and College Garden	JS	June 17 - May 18
37.	ISO	MSV/DHPG	June 17 - May 18
38.	Press and publicity	BMV	June 17 - May 18
39.	Foreign students cell	MPV	June 17 - May 18
40.	Governing council meeting	Principal's Office	June 17 - May 18

41.	Monthly/Annual report of college activities to JSSU and other agencies	HoDs/JL	June 17 - May 18
42.	College website	HKS/VKG	June 17 - May 18
43.	Research & Consultancy Co-ordinator • Collaboration with Industries/organizations • Interdepartment/Interdisciplinary research	SBC	June 17 - May 18
44.	Co-ordinator - JSSUonline.com	VKG/ABP	June 17 - May 18
45.	JSSU Newsletter	BMV	June 17 - May 18
46.	Annual group photo session	KM/Shivanna	June 17 - May 18
47.	Lab coat and Blazers	JS	June 17 - May 18
48.	Notice Board (SNB, LNB and IIPC), Departmental staff list	Nagaraju	June 17 - May 18
49.	Stock verification	Office staff/Librarian	June 17 - May 18
50.	Student Liaison	Ms. Divya S	June 17 - May 18
51.	Student ID Cards	Shivanna / Manjunath	Within a month of Commencement of course

B.PHARM

Program Educational Objectives (PEOs):

PEO 1: To acquire the theoretical knowledge of pharmaceutical sciences

PEO 2: To acquire practical skills in

- isolation of medicinal compounds from natural sources
- synthesis and analysis of medicinal compounds
- screening medicinal compounds for pharmacological activities
- formulation of pharmaceutical dosage forms and their evaluation

PEO 3: To develop competent Pharmacists with ethical attitude, research intuition, leadership qualities, to participate in public health programs and engage in life-long learning

Program Outcomes (POs):

1. Ability to acquire knowledge of pharmaceutical sciences
2. Ability to design and conduct experiments, to analyze and interpret data
3. Ability to demonstrate effective planning, develop and implement plans within time frame.
4. Ability to function effectively individually and on teams, including diverse and multidisciplinary, to accomplish a task.
5. Ability to understand and appreciate the role of pharmacist in healthcare services.
6. Understanding of professional, ethical, legal, security and social issues and responsibilities.
7. Ability to understand contemporary issues relating to pharmacy profession and challenges ahead.
8. Awareness of ethical and professional responsibilities.
9. Possess the necessary interpersonal and communication skills to be a productive member of the team in work environment.
10. Ability to use current techniques, skills, and modern tools.
11. A strong background and motivation to pursue life-long learning

COURSE HAND OUT 2017-18 Class: VI Semester - B. Pharm

1. Course Details

Course Code	Name of the course	No. of hours	Tutorial	Credit points
BP601T	Medicinal Chemistry III – Theory	3	1	4
BP602T	Pharmacology III – Theory	3	1	4
BP603T	Herbal Drug Technology – Theory	3	1	4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	3	1	4
BP605T	Pharmaceutical Quality assurance – Theory	3	1	4
BP606P	Medicinal chemistry III – Practical	4	-	2
BP607P	Pharmacology III – Practical	4		2
BP608P	Herbal Drug Technology – Practical	4	-	2
	Total	**27**	**5**	**26**

2. Evaluation:

a. Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment, as per the scheme given below.

Table 1: Scheme for awarding internal assessment: Continuous mode

THEORY		
Criteria	**Maximum Marks**	
Attendance	4	2
Academic activities (Average of any 3 activities e.g. quiz, assignment, open book test, field work, group discussion and seminar)	3	1.5
Student – Teacher interaction	3	1.5
Total	**10**	**5**
PRACTICALS		
Attendance	2	
Based on Practical Records, Regular viva voce, etc.	3	
Total	**5**	

Table 2: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95 – 100	4	2
90 – 94	3	1.5
85 – 89	2	1
80 – 84	1	0.5
Less than 80	0	0

b. Sessional Exams

Two Sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical Sessional examinations is given below. The average marks of two Sessional exams shall be computed for internal assessment as per the requirements.

Sessional exam shall be conducted for 30 marks for theory and shall be computed for 15 marks. Similarly Sessional exam for practical shall be conducted for 40 marks and shall be computed for 10 marks.

Question paper pattern for theory Sessional examinations

For subjects having University examination

I. Multiple Choice Questions (MCQs)		
(Answer all the questions)	=	10 x 1 = 10
I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 2 out of 3)	=	2 x 5 = 10

Total	=	30 marks

For subjects having Non University Examination

I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 4 out of 6)	=	4 x 5 = 20

Total	=	30 marks

Question paper pattern for practical sessional examinations

I. Synopsis	=	10
II. Experiments	=	25
III. Viva voce	=	05

Total	=	40 marks
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3. End semester examinations

The End Semester Examinations for each theory and practical course through semesters I to VIII shall be conducted by the university except for the subjects notified as non-university examinations

Table 3: Scheme for internal assessments and university examination - Semester-IV

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP601T	Medicinal Chemistry III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP602T	Pharmacology III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP603T	Herbal Drug Technology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP605T	Pharmaceutical Quality assurance – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP606P	Medicinal chemistry III – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP607P	Pharmacology III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP608P	Herbal Drug Technology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
Total		**65**	**105**	**17 Hrs**	**170**	**480**	**27 Hrs**	**650**

Question paper pattern for end semester theory examinations

For 75 marks paper

I. Multiple Choice Questions (MCQs)
(Answer all the questions) = 20 x 1 = 20
I. Long Answers (Answer 2 out of 3) = 2 x 10 = 20
II. Short Answers (Answer 7 out of 9) = 7 x 5 = 35

Total = 75 marks

For 50 marks paper

I. Long Answers (Answer 2 out of 3) = 2 x 10 = 20
II. Short Answers (Answer 6 out of 8) = 6 x 5 = 30

Total = 50 marks

For 35 marks paper

I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 5 out of 7)	=	5 x 5 = 25

Total	=	35 marks

Question paper pattern for end semester practical examinations

I. Synopsis	=	5
II. Experiments	=	25
III. Viva voce	=	5

Total	=	35 marks
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4. Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of B.Pharm. programme if he/she secures at least 50% marks in that particular course including internal assessment. For example, to be declared as PASS and to get grade, the student has to secure a minimum of 50 marks for the total of 100 including continuous mode of assessment and end semester theory examination and has to secure a minimum of 25 marks for the total 50 including internal assessment and end semester practical examination.

5. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified (in promotion and award of grades), then he/she shall reappear for the university examination of that course. However his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

6. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the Sessional exam component of the internal assessment. The re-conduct of the Sessional exam shall be completed before the commencement of next end semester theory examinations.

7. Re-examination of end semester examinations

Reexamination of end semester examination shall be conducted as per the schedule given in Table 4. The exact dates of examinations will be notified from time to time.

Table 4: Tentative schedule of university examinations and supplementary examinations

Semester	Regular examinations	Supplementary examinations
I, III, V and VII	November / December	May / June
II, IV, VI and VIII	May / June	November / December

8. Grading of performances

Letter grades and grade points allocations

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course.

Table 5: Letter grades and grade points equivalent to percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	A+	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent in any form of evaluation/examination, letter grade allocated to him/her should be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

9. Declaration of class

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction = CGPA of. 7.50 and above
First Class = CGPA of 6.00 to 7.49
Second Class = CGPA of 5.00 to 5.99

10. Attendance: The marks is allotted based on the attendance percentage (Table 2)

11. Chamber consultation hours: Any time during college hours.

12. Tutorial Class: Objective of the tutorial is to enhance the learning ability and help students in better understanding of the subject. This provides a best opportunity for the students to clarify their subject doubts. This involves discussions, presentations on specified topics, assignments and evaluation.

BP601T. MEDICINAL CHEMISTRY – III (Theory)

Teacher: Dr. H Yogish Kumar (HYK) **45 Hours (3 Hrs/ week)**

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

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.

Lecture wise programme:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (*)

	Topic	Hrs
1.	**Antibiotics** Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. **β-Lactam antibiotics:** Penicillin, Cepholosporins, β- Lactamase inhibitors, Monobactams **Aminoglycosides:** Streptomycin, Neomycin, Kanamycin **Tetracyclines:** Tetracycline, Chlortetracycline, Minocycline, Doxycycline	**10**
2.	**Antibiotics** Historical background, Nomenclature, Stereochemistry, Structure activity 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.	**10**

Antimalarials: Etiology of malaria.

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

Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil.

Miscellaneous: Pyrimethamine, Artesunete, Artemether, Atovoquone.

3. **Anti-tubercular Agents** **10**

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

Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine Streptomycine, 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, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.

4. **Antifungal agents:** **10**

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

Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, 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, Praziquantal, Ivermectin.

Sulphonamides and Sulfones

Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole.

Sulfones: Dapsone*.

5. **Introduction to Drug Design** **08**

Various approaches used in drug design.

Physicochemical parameters used in quantitative structure activity relationship

(QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis.

Pharmacophore modeling and docking techniques.

Combinatorial Chemistry: Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.

Theory Sessional examination syllabus

Sessional No.	Syllabus
	Chapters no.
I	1, 2 and 3 (anti tubercular agents)
II	3 (from Urinary tract infections) ,4 and 5

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

BP606P. MEDICINAL CHEMISTRY- III (Practical)

Teacher/s: Dr. H Yogish Kumar (HKY) **60 Hours (4 Hrs/ week)**

List of Experiments

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)

BP602 T. PHARMACOLOGY-III (Theory)

Teacher/s: Dr. A. Muthuraman (AM) **45 Hours (3 Hrs/ week)**

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory and gastrointestinal system, infectious diseases, immuno-pharmacology and in addition, emphasis on the principles of toxicology and chronopharmacology.

Objectives: Upon the completion of the course student shall 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 and
3. appreciate correlation of pharmacology with related medical sciences.

Lecturewise program

Chapter	Topic	Hrs
1	**Pharmacology of drugs acting on Respiratory system** a. Antiasthmatic drugs. b. Expectorants and antitussives c. Nasal decongestants. d. Respiratory stimulants **Pharmacology of drugs acting on the Gastrointestinal Tract** a. Antiulcer agents. b. Drugs for constipation and diarrhoea. c. Appetite stimulants and suppressants. d. Digestants and carminatives. e. Emetics and anti-emetics.	10
2	**Chemotherapy** a. General principles of chemotherapy. b. Sulfonamides and cotrimoxazole. c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides	10
3	**Chemotherapy** d. Antitubercular agents	10

e. Antifungal drugs
f. Antileprotic agents
g. Antifungal agents
h. Antiviral drugs
i. Anthelmintics
j. Antimalarial drugs
k. Antiamoebic agents

4 Chemotherapy **08**

l. Urinary tract infections and sexually transmitted diseases.
m. Chemotherapy of malignancy.

Immunopharmacology

a. Immunostimulants.
b. Immunosuppressants.

5 Principles of toxicology **07**

a. Definition of acute, subacute and chronic toxicity.
b. Definition of genotoxicity, carcinogenicity, teratogenicity and mutagenicity
c. General principles of treatment of poisoning
d. Clinical symptoms and management of barbiturates, morphine, organophosphosphorus compound and lead, mercury and arsenic poisoning.

Chronopharmacology

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

Theory Internal assessment syllabus

Internal assessment No.	Syllabus Chapters no.
I	1 to 3f (till antileprotic agents)
II	3g (from antifungal agents) to 5

BP 607 P. PHARMACOLOGY-III (Practical)

Teacher/s: Dr. Muthuraman (AM), Mr. Abith Bhat, Mr. Bhavimani Guru & Mr. Bipul Ray

60 Hours (4 Hrs/week)

List of Experiments

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 ligated (SHAY) rat model & NASIDs induced ulcer model*
4. Study of effect of drugs on gastrointestinal motility*.
5. Study of antimicrobial activity using disc diffusion method
6. Study of antimicrobial activity using cup plate method
7. Study of antimicrobial activity using serial dilution method
8. Study of antioxidant activity using DPPH assay
9. Estimation of serum biochemical parameters by using semi-autoanalyzer
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*

Recommended Books: (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
9. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,
10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

BP 603 T. HERBAL DRUG TECHNOLOGY (Theory)

Teacher/s: Dr. K. Mruthunjaya (KM) **45 Hours (3 Hrs/ week)**

Scope: This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

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

1. understand raw material as 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

Lecture wise Programme:

Chapter	Topic	Hrs
1	**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 cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/ Bioinsecticides.	10
2	**Evaluation of Drugs** WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs. **Natural sweeteners and bitters** **Patenting and Regulatory requirements of 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.	10

3	**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: Alfa alfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina	**10**
4	**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 products.	**08**
5	**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 equipments, standard operating procedures, health and hygiene, documentation and records.	**07**

Theory Internal assessment syllabus

Internal assessment No.	**Syllabus Chapters no.**
I	1 to 3 (Nutraceuticals – General aspects)
II	3 (from Health benefits), 4 & 5

BP 608 P. HERBAL DRUG TECHNOLOGY (Practical)

Teacher/s: Dr. A. Muthuraman (AM) **60 Hours (4 Hrs/week)**

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 Ayurvedic formulation
8. Determination of swelling index and foaming index
9. Monograph analysis of castor oil

Recommended Books (Latest Editions)

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

BP 604 T. BIOPHARMACEUTICS AND PHARMACOKINETICS (Theory)

Teacher/s: Dr. Amit B. Patil`(ABP) 45 Hrs (3 Hrs/week)

Scope: This subject is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply Biopharmaceutics theories in practical problem solving. Basic theoretical discussions of the principles of Biopharmaceutics and pharmacokinetics are provided to help the students' to clarify the concepts.

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

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

Lecture wise Programme:

Chapter	Topic	Hrs
1	**Introduction to Biopharmaceutics** **Absorption**; Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes, Distribution of drugs Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein bin-drug binding	10
2	**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
3	**Pharmacokinetics:** Introduction to Pharmacokinetics models,	10

	Compartment models, Non compartment models, physiological models, One compartment open model. a. Intravenous Injection (Bolus) b. Intravenous infusion, extra vascular administrations, calculations of Ka, KE. From plasma and urinary excretion data	
4	**Multicompartment models:** Two compartment open model. IV bolus **Multiple – Dosage Regimens:** a). Repititive Intravenous injections – One Compartment Open Model b). Repititive Extravascular dosing – One Compartment Open model	**08**
5	**Nonlinear Pharmacokinetics:** a. Introduction, b. Factors causing Non-linearity. c. Michaelis-menton method of estimating parameters, Biotransformation of drugs	**07**

Theory Sessional examination syllabus

Sessional No.	Syllabus
	Chapter No.
I	1 to 3 (till physiological models)
II	3 (from one compartment model) to 5

Recommended Books: (Latest Editions)

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition,Prentice-Hall Inernational edition.USA
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal,Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick
8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and 9. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
9. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company,Pennsylvania 1989.
10. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.
11. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvnia

BP 605 T. PHARMACEUTICAL QUALITY ASSURANCE (Theory)

Teacher/s: Dr. M.P. Gowrav (MPG) 45 Hours (3 Hrs/ week)

Scope: This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It covers the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

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

1. understand the cGMP aspects in a pharmaceutical industry
2. appreciate the importance of documentation
3. understand the scope of quality certifications applicable to pharmaceutical industries
4. understand the responsibilities of QA & QC departments

Lecturewise Programme:

Chapter	Topic	Hrs
1	**Quality Assurance and Quality Management concepts:** Definition and concept of Quality control, Quality assurance and GMP **Total Quality Management (TQM):** Definition, elements, philosophies **ICH Guidelines**: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines **Quality by design (QbD)**: Definition, overview, elements of QbD program, tools **ISO 9000 & ISO14000**: Overview, Benefits, Elements, steps for registration **NABL accreditation** : Principles and procedure	**10**
2	**Organization and personnel:** Personnel responsibilities, training, hygiene and personal records. **Premises:** Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination. **Equipments and raw materials:** Equipments selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.	**10**
3	**Quality Control:** Quality control test for containers, rubber closures and secondary packing materials.	**10**

	Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities	
4	**Complaints:** Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal. **Document maintenance in pharmaceutical industry:** Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.	**08**
5	**Calibration and Validation:** Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation. **Warehousing:** Good warehousing practice, materials management	**07**

Theory Sessional examination syllabus

Sessional No.	Syllabus
	Chapter No.
I	1 to 3 (till Quality control)
II	3 (from Good laboratory practices) to 5

Recommended Books: (Latest Edition)

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Deckker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines

Jagadguru Sri Shivarathreeshwara University

JSS College of Pharmacy

Sri ShivarathreeshwaraNagara, Mysore-570015

CLASS TIME TABLE – 2017-18*

Class: B. PHARM VI- Semester

Lunch Break: 1.00 to 2.00 PM
Tea Break: 10.40 to 11.10 AM
3.50 PM to 4.05 PM

Time / Day	9.00-9.50AM	9.50-10.40AM	TEA BREAK	11.10-12.05PM	12.05–1.00PM	LUNCH BREAK	2.00-2.55PM	2.55-3.50PM	TEA BREAK	4.05-5.00PM	4.05-5.00PM
Monday	---------	Biopharmaceutics & Pharmacokinetics **ABP**		Quality Assurance MPG	Biopharmaceutics & Pharmacokinetics **ABP (TU)**		Herbal drug technology KM	Pharmacology-III AMR		Medicinal Chemistry-III HYK	---------
Tuesday	---------	Medicinal Chemistry-III HYK		Biopharmaceutics & Pharmacokinetics **ABP**	Pharmacology-III AMR		←--------Medicinal Chemistry—III -- ← Pharmacology-III---------- ← ----Herbal drug technology			----------BI ---MNP----------→ ---------- BII---AMR ----------→ ----------BIII ---KM ----------→	
Wednesday	---------	Quality Assurance MPG		Medicinal Chemistry-III HYK	Herbal drug technology KM		←--------Medicinal Chemistry—III -- ← Pharmacology-III---------- ← ----Herbal drug technology			----------BII ---HYK----------→ ---------- BIII --ABP---------→ ----------BIV ---KM ----------→	
Thursday	---------	Quality Assurance MPG		Pharmacology-III AMR	Herbal drug technology KM		←--------Medicinal Chemistry—III -- ← Pharmacology-III---------- ← ----Herbal drug technology			----------BIII ---BRP----------→ ---------- BIV –BG ----------→ ----------BI ---KM----------→	
Friday	---------	Biopharmaceutics & Pharmacokinetics **ABP**		Quality Assurance MPG (TU)	Pharmacology-III Tu AMR		←--------Medicinal Chemistry—III -- ← Pharmacology-III---------- ← ----Herbal drug technology			----------BIV---BMG ----------→ ---------- BI---BR ----------→ ----------BII ---KM ----------→	
Saturday	---------	Medicinal Chemistry-III HYK (TU)		Herbal drug technology KM (TU)			----------				

***Effective from: 11th December 2017**

Note: 1. No tea break for practicals
2. Forenoon practical starts from 10.00AM

Time table Coordinator

Principal

Copy: SNB/LNB/SCF/SCC-Teachers/OC/TTF-MSV/PP Dept./Extra-MSV.